

THE GREAT AND
NEW ART
OF
WEIGHING
VANITY:

OR

A Discovery of the Ignorance and Arrogance of the great and new Artist, in his Pseudo-Philosophical Writings.

By *M. Patrick Mathers*, Arch-Bedal to the University of S. Andrews.

To which are annexed some *Tentamina de motu penduli & projectorum*.



GLASGOW,

By ROBERT SANDERS, Printer to the City, and University, 1672.



**DUPLICATE
FOR SALE 1769**



T H E
P R E F A C E
T O T H E
R E A D E R.



E A D E R,

I-doubt not but thou art surpris'd to find me in print : and I assure you, that it is not more above your hope and expectation, then it is contrair to my former designs and resolutions : But as *Atis* his dumbness from the womb could not keep him from bursting into speech against those souldiers whom he saw ready to have killed his father ; so my general insufficiency in all things else, cannot keep my natural affection in longer silence, when

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Let my bountiful Mother, this ancient and famous University, and all her beautiful Daughters, the other Universities of this Kingdom, in hazard to be murdered by one of their unnatural children.

And finding that he with whom I have to do, hath given but a very lame and partial account of the occasion of our debate, I judge it both thy interest and mine, that I correct it by a more full, perfect and impartial one: For as the Magicians feigned miracles found greater belief with the *Egyptians*, then the true ones of *Moses*; so a false information having nothing to contradict it, oft times prevails as true with us.

Thus then it is. My adversary having published his *Tyrocinia Math.* and his *Ars. Magna & Nova*, &c. one here who well understands those things, intending to oblige the Author, and redeem his Countrey from further injury by his writings, friendly represented to him some of his failings in them. And another, whose judgement he ought to have esteemed much, with the same intention, expressed to one of his nearest friends, his dislike of those

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those Books, and his regrave for the loss which the Author put himself and his Countrey to by them. But this was not sufficient to convince him of his weakness; for he proceeds to give the world another instance of his folly, in printing his *Hydrostaticks*; and notwithstanding what had past, he yet fancies that the Masters of this University have as high an esteem of his sufficiency, as he himself: And therefore not doubting of their encouragement to so noble a work, he confidently sends his petitory letters to some of them, intreating their own concurrence, and their assistance for procuring the encouragement of others thereto.

With his Letters, he sent this following Edict.

Forasmuch as there is a Book of Natural and Experimental Philosophy in English, to be printed within these four moneths; or thereabout; Wherein are contained many excellent and new purposes: As first, Thirty Theorems, the most part whereof were never so much as heard of before: in which are proposed briefly the chiefest and most useful principles of that new Doctrine, anent the wonderful weight, force,

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and pressure of the water in its own Element. There are next, twenty Experiments in order to that Doctrine, not only most pleasant, and most easie to all capacities, but most useful likewise, which are set down after this method. First, each particular Experiment is briefly and clearly described, by its own distinct Schematism and Figure. Secondly, the curious Operations, and natural effects of it are shewed. Thirdly, the true causes of these natural effects are searched into, and most evidently explicated, and demonstrated; not only by the force of reason, but by the evidence of sense also. And lastly, at the close of each Experiment, you will find most naturally deduced from the preceeding Demonstrations, many excellent and new Conclusions (hitherto unknown) and these for the advancement of natural knowledge, and practice; among which, mention is made of a new and more commodious way of Dyving. After all which, there is a number of Miscellany Observations; some whereof are Experiments made in Coal-smocks, for knowing the power of Damps, and ill Air, by killing of Animals. Some made for knowing the variation of the Compass here: and an excellent way for knowing, by the eye, the Sun or Moons motion in a second of time, which

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is the 3600. part of an hour; and many others of different kinds, useful and pleasant.

These are therefore to give notice to all ingenious Persons, who are lovers of Learning, that if they shall be pleased to advance to Gedeon Shaw Stationer, at the foot of the Ladies steps, three pound Scots, for defraying the present charges of the said Book, they shall have from him, betwixt the date hereof and April next to come, one of the Copies: And for their further security in the interim, the Authors obligation for performing the same. Edinburgh the 14. of December 1671.

Which so exposed to my Masters the vanity of that confident man, that they were forced plainly to let him know their mind, as is expressed in the first Letter of his *Postscript*.

To this he returned an answer, which, though it as little deserved his superlative commendation, as their censure, was abundantly discreet for obliging them to silence, until his Book should come to light. But to show how contrair to his nature this was, it quickly repented him of his discretion; and a little after, without any such provocation, as he alledges, he alarmed

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this place with a flood of his fury, whereof he dischargeth himself in the second letter of his *Postscript*.

My Masters thought it unworthy of them to give any reply to this, lest by engaging themselves in a debate with one who had nothing wherewith to entertain them, except railing and calumnies, they had stained their reputation, and gained to themselves nothing but the name of foolish persons, for speaking to a fool in his folly: but I (to be ingenuous) having no much greater reputation for learning than himself, was content to hazard it against him: and knowing well his bragging humor to be such, as would make him insult and erect Trophies, if nothing were replied, I sent to him a Letter, which, to my best remembrance, was in the words following.

Sir, I admire exceedingly the forwardness of your humor (I will call it no worse) in your last to ———: he is a person not concerned in you or in your books, neither will he ignorantly commend any thing, as it seems ye expected he should have done, when ye sent him these papers. Ye might have known long ago, that he had no

venera-

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veneration for what ye had formerly published; for he made no secret of his mind, when he was put to it. Ye may mistake him, if ye think that any by-end will cause him speak what he thinks not: nevertheless he delivered your commission, and was willing to be unconcerned, expecting their answer. They pressed him to know his judgement of your last piece: he told ingenuously the truth, that there was none of them had less esteem for it then himself. He hopes ye are so much a Christian, that ye will not be offended with him for speaking what he thought, when he had a call to it; and yet, albeit ye seem to favor him more then others, he hath ground to look upon himself as one of the Sophistical rable, for they only are such who condemn any thing ye do, the rest of the Univerſity continuing always learned persons. It is to no purpose to apologize for themselves, ye take all for granted, which ye have heard: I shal not put you to the pains of proving it; yet it seems ye would hardly have believed it so easily, had not your conscience told you, that they had some reason for their judgement, which really was this following: That they see nothing in your last piece, new and great, (albeit it be *Ars nova & magna*.) save errors and non-sense; as your demonstrations of the

Pen-

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Pendulum, your *Nihil spatiale*, your *Gravitas circularis & horizontalis*; your question, Whether or no a body may be condensed in a point? &c. too many to fill several letters: for ye must not call experiments new inventions, otherwise we are all making new inventions every day; neither must ye call different explications new inventions, else the same thing might be invented by almost every Writer. I admire how ye question the R. Society; for I desire to know one point of doctrine, which ye or they either pretend to, concerning the weight of the air, the spring of it, or anything else in your book, save mistakes, which was not received by all Mathematicians, and the most learned of Philosophers, many years before any of you put pen to paper. Ye have been at much pains to prove that by experiment, which all the learned already grant, and some have demonstrat à priori from the principles of Geometry and Staticks, and many à posteriori from experience, if sense may be called a demonstration: Yet ye are the only man who produceth the *Ars nova & magna*, when all others are out of fashion. But more to your commendation, it seems ye do all these wonders by *Magick*; for ye have the ordinair

prin-

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principles of none of these Sciences: Euclid is as much a stranger, as reason in all your Books: and for this, Perque Mathematicos semper celebrabere fastus! At last ye come to prove a new doctrine, which before now was near 2000. years old, with thirty new Theorems, which must not be named, because they are of such a tender and delicat complexion, that the very naming of them will make them old. There are also many other excellent things, which will be all new when they were printed but yesterday. It is like, some of these dayes, we may have an Ars nova & magna, to prove that a piece of lead is heavier then so much cork. I know not wherefore ye undervalue any man, because he hath not as great esteem for your notions as your self: Have not we as much freedom to speak our mind of you, as ye have to write yours of the R. Society, and the University of Glasgow? The greatest hurt ye can do us, is to make Dromo famulus one of our Principals. I think it not strange that ye using only demonstrations of sense, should admire the force of our imagination, in affirming no method of Dyving so good as that of Melgim. I am sure that the man dyving for a continual time, if he be not also of your invention, must breath of the air; and
this

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this air must either be kept close by it self, as in Melgims way, or communicat with the air above. If the latter be your invention, I doubt ye must also have some Chirurgical invention to apply to your Dyver at his return, if he go to any great deepness: If the former, it is the same with Melgims; and you cannot, neither any man else help it, but in circumstances (which alters not the method,) and perchance to little purpose. As for Archimedes, I am sure he wanted no necessary requisit to prove the weight of water in its own Element. I know not what else ye intend to prove: always I am as sure that he had two great requisits, which ye want; to wit, Geometry, and a sound head. As to what ye write concerning the imperfections of Sciences; the scientificall part of Geography is so perfected, that there is nothing required for the projection, description and situation of a place, which cannot be done and demonstrat. The scientificall part of Opticks is so perfected, that nothing can be required for the perfection of sight, which is not demonstrat, albeit mens hands cannot reach it; and these being the objects of the fore-said Sciences, your authority shal not persuade me, that it is altogether improper to call them perfect. In the Hydrostaticks, it were

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no hard matter to branch out all the Experiments that can be made, into several Classes, of which the event and reason might presently be deduced, as conſectaries (I ſpeak not here of long deductions, as ye ſeem to rant) to ſomething already publiſhed: if it be noticed but rudely (as ye, not underſtanding what niceties of Proportion means, muſt do) only conſidering motion and reſt: And I believe there is none ignorant of this, who underſtands what is written in this Science. Upon this account writing to you, I might call it perfect; albeit I know there are many things relating to the proportion and acceleration of the motions of fluids, which are yet unknown, and may perchance ſtill be. Ye ſhal not think that I ſpeak of you without ground; for in your *Ars magna & nova*, ye bring in your great attempts for a perpetual motion; all which a novice of eight days ſtanding in *Hydroſtaticks* would laugh at. I do not queſtion that this age hath many advantages beyond former ages; but I know not any of them, it is beſholden to you for: only I admire your ſimplicity in this. *Aſtronomers* ſeek always to have the greateſt intervals betwixt obſervations, and ye talk that ye will give an excellent way for obſerving the Sun or Moons motion for a ſecond of time; that is to ſay, as if it were a great matter that there is but a ſecond of time betwixt your obſervations. I wonder ye tell me the eye ſhould be added; for the invention had been much greater, had that been away. I do confeſs
that

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that a good History of nature is absolutely the most requisite thing for learning; but it is not like that you are fit for that purpose, who so surely believe the Miracles of the West, as to put them in print; and record the simple meridian altitudes of Comets, and that only to halfe of degrees, or little more, as worth noticing. However, if ye do this last part concerning Coal-sinks well, and all the rest be but an Ars magna & nova, ye may come to have the repute of being more fit to be a Collier then a Scholar. Ye might have let alone the precarious principles and imaginary wordles of Des Cartes, until your new inventions had made them so: For I must tell you, Des Cartes valued the History of Nature, as much as any experimental Philosopher ever did, and perfected it more with judicious experiments, then ye will by all appearance do in ten ages. Ye are exceedingly misinformed, if ye have heard that any here have prejudice or envy against you; for there is none here speaks of you but with pity and commiseration: neither heard I ever of any man who commended you for what he understood. As for your Latin Sentences, if they be not applyed to your self, I understand them not; for here we are printing no Books, we are not sending tickets through the Countrey to tell the wonders we can do: We are going about the employments we are called to, and strive to give a reason for what we say. Where then are our doli & fallaciae, tabulae & testes, sapientia ad quam putamus nos pervenisse? &c. In these things ye publish, ye know there is no Sophistry, but clear evidence

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dence: If ye had done such great matters in Univers
sale & ens rationis, ye might have had a shift; but
here ye must either particularize your inventions, or
otherwise demonstrat your self derogatory to the crea
dit of the Nation: For what else is it to confound
R. Societies and Universities with an Ars magna
& nova; and yet when ye were put to it in print, to
show your inventions, all ye could say was, that
the publisher should have reflected upon the wisdom of
the Creator, &c. so that the Poët said well of Demos
crites, &c. of which I understand not the sense, ex
cept ye make your self the summus vir, and us all
the Vervetes. I suppose this may be the great cre
dit that ye say ye have labored to gain to your Nation;
to wit, to get us all the hornable title of Wedders.
No more at present, but hoping this free and ingenuous
Letter shal have a good effect upon you (for I am
half perswaded, that the flattery of scorers and igno
rants, hath brought you to this height of imagin
ary learning) and that when ye come to your self, ye
will thank me for my pains. I rest,

Your humble servant.

After this I had no notice of him or his
Book, until a copy of it came to my hands:
which, when I had opened it, I found dedi
cat to a *Noble Person*; whose very name
being there, did creat in me a greater re
spect for the Book, then I thought my self
capable of for any of the Authors works;
and made me fear some finer things in this,
then

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then any other of his Books would suffer me to expect. For having known his Lordship an ornament to this Place, when his Vertue was but in blossom, I have easily given credit to that universal testimony, which reports him to have gained to himself an high esteem among Strangers, by those excellencies, which are the glory of his Family and Name; and therefore I could not but apprehend this present, offered to his Lordship on so solemn a day, to be something extraordinary.

But having read over his *Theorems*, I admired the presumptuous arrogance of the Author, in concerning the authority of so Noble a Name in so worthless a triffle: And having returned to the Dedication, to see what he said for himself, I justified his first application for *Pardon*, that he had prefixed his *Lordships Name* to the baffle and abuse of a *Noble subject*. Then I considered the *motives* of the Dedication, and found them *great*; yea so great, that I wonder they did not fright him from so daring an attempt: For his *Lordship*, I hope, hath not given *security* to Strangers abroad, that he might draw upon himself *injury* from his

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his Countrey-men at home; his *vertues* have not made an *Italian shelter under his Patronage*, that this bold Scribler might be encouraged to send his *Lordship* through the world, as a Protector of falshood, and countenancer of such as cannot handle truth without corrupting and defiling it. Could not his *Lordships Heroick vertues*, and *understanding mind*; could not the *learning* and other excellent endowments of his *Lordships Father, Grand-father, and Great-Grand-father*; could not the *Dignity* of their famous *Ancestors*, and the *Antiquity* of their *Illustrious Family*, preserve him from the importunity of this impudent man, who will needs *enlighten* his dark ignorance with the *splendor of his Lordships Name*? Was not his *Lordships* being an encouragement to learning, sufficient to have kept this arrogant pretender there o, from soliciting his *Lordships authority*, to his folly and infirmity? Surely, when he adressed this Book, he either little considered his *Lordships abilities to judge thereof*, or else he intended to court his friendship and affection, for a defence against the power of his understanding; & if he gain his design,

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he hath reason to say, that his *Lordships* goodness is proportioned to his other accomplishments.

After this view of the *Dedication*, I went through the rest of the Book unto the *Postscript*, where I find mention made of the Letter which I sent to the Author, who was wiser then to print it, lest thereby he had published his own shame; but he lets it not pass without a cast of his craft: For finding that by it his *ignorance is discovered*, he foams and rages, he is troubled in spirit, because he is disturbed in the *exercise of his Art*; that is, because he is not permitted to call *other mens truths, his own*, and his own *falsehoods and follies*, rare and useful truths, and obtrude them upon the world as such; and being fettered with that *reason* which opposeth him, he, in the *bitterness of his spirit*, vomits out his *sight* against her, calling her *Sophistry*, *Non-sense*, and whatever his anger suggests to him: and breathing nothing but *revenge*, he calls together his choicest virtues *Fury, Malice, and Boldness*; and having got them to joyn with his *Ignorance*, he endeavors by these *united forces*, to uphold his cause: Nor was any of them

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them wanting to him; as may appear from their particular achievements, which are remarkable in that review of *my Letter*, which summeth up his *Postscript*; and in sum, equally betrayes his *Insufficiency and Insincerity*. For therein he treateth the *Masters of this University* so unworthily, (as he had done in the *second Letter* of his *Postscript*, in answer to that *Gentleman*, who, by direction, wrote unto him their mind) that I know nothing like it, except the *spirit of its Author*, and that entertainment which he in the *Preface* to his *Arsmagna*, and pag. 472. gives to the late Arch-Bishop of Glasgow (who had been most kind to him) and *Masters of the Colledge* there, in which some then were, & yet are, who may be *his teachers* in any thing he pretends to.

But this *Postscript* doth not sufficiently discover the *Authors vertues*, and therefore he spends a part of his first *Epistle to the Reader*, in such flat and vulgar railings, as prove him fitter for nothing, then to hold the *principality among the Street-solders*. And moreover, that the provocation may be compleat, he gives a *formal appeal* to any who dare state himself his *adversary*: and

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makes such ostentation of his *strength and courage*, that, rather than want a combatant, he will purchase one with gold; for he offers a *Guiny* for every *Theorem* which shall be everted; either in this, or his last Book. And such is his generosity, that I cannot doubt, but he will also be as noble in requiting the labor of any, who shall give him some *Tyrocinia*, whereby he may correct his *discovered errors*.

Sure I am, there may be as much gained here as would tempt my *Adversary* once again, to blot a great many *sheets of paper*, if to boot, he could be assured of a *Crown*, or *Rex-dollar*, or (rather than lose his market) a *Legged-dollar*, for every Book that should stand himself no more than *two Merks*.

Now, *Reader*, I am confident thou thinks me further engaged after all these *provocations*, then that I can retreat with honour; and so think I my self: And therefore I have accepted my *Adversaries Challenge*. I have examined all his *Books*: I have weighed them in the ballance of *reason*, and have found them so *light*, that they deserve no better name then *Vanity*. I have displayed the *Authors infirmity and folly* in every
one

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one of them, without other design then to protect my Countrey, and particularly all such as he endeavours to concern in his *Writings*, from the *mean thoughts and misapprehensions* of those who have no other character of both, then they receive from them.

Yet in this *Review* I have not displayed all the enormities of this *Arrogant pretender to Knowledge*; for this should have made my Book swell as far above a just measure, as his *Arrogance and Insolence* is above every thing, except his *Ignorance*; seeing every period of his *Writings* is either pregnant with *falsehood*; or if it contain a *truth*, which he hath taken from some other, his probation thereof is either from false principles, or management so *silly and childish*, as makes it appear *ridiculous*. Neither have I taken notice of all the *impertinencies* whereof he is guilty, lest thereby I had hazarded the reputation of my good nature: But I have only exposed some of his *grosser failings*, to let the world know, that he hath not so much wit, as himself presumes; and discovered his *inveterate malice*, to undeceive those who think him a man of much *sincerity*.

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And this I have done with so much evidence and demonstration, that I fear not thy censure, if thou be *intelligent*: Nor have I sent this book to your hands, under any other *Patricony*, then that of *Reason*; for she is able to recommend it to the favour of my *Friends*, and protect it from the *Fury* and *Malice* of my *enemies*. But if it were not, that the meanness of my person and station should have made my address as indecent, as the *naughtiness* of my *Adversaries* *Present* made his, I would have offered it (as a testimony of my humble duty, and sincere respect) to that *Noble Person*, to whom he hath dedicat his *Hydrostaticks*; and as earnestly have solicited his *Understanding* to judge of my *Truths*, as my *Adversary* hath done his *Lordships Friendship* to accept, his *Favour* to protect; and his *Name* and *Authority* to convoy his *Falshoods* through the world. Nor should I either have precipitated or suspended my address for finding so craving an opportunity, as the day of his *Lordships Birth* and *Majority*.

From my Chamber in S. Andrews,
the 14. day of July 1672.

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AS in combating, each party first intends his own defence, and in the second place only prepares an assault for his *Antagonist*: So I, before I make any attempt on my *Adversaries other Writings*, shal endeavour to wipe off that durt which he hath thrown upon me, in the *Postscript* and *Preface* to his *Hydrostatics*.

I think it no wonder that my *Adversary* hath suppressed that *Letter* of mine, which he mentioneth in his *Postscript*, and I have printed in my *Preface*; for this gives him

the greater liberty to belie it; which he doth most splendidly, when he saith, that it is full of barbarous railings, passing all bounds of civility against himself, friends, and works: (whereas there is not a word of his friends in it: and what is therein said of his Works, the following *Treatise* will manifest, if it deserve the name of barbarous railings.) Nor is it strange to see one who wants truth on his side, make lies his refuge: But he may henceforth look for the common infelicity of liars, not to be believed, if he shal chance to stumble upon truth.

I had reason to fall upon his *Ars magna*, &c. because I judge *ex ungue Leonem*, or rather, *ex cauda Catum*. Nor should the bare title have been past by, because it is arrogant and false, as shal be made to appear in its own place. I am unjustly in this compared to blind *Veiento*; for he had the beast but at one hand; but to whatever hand I turn me, I find the beast there. And because my *Adversary* complains, that I have only snarled at the horse heels, I shal henceforth endeavour to pull the *Ass* from the saddle.

I excuse my *Adversary* for not interpreting

preting his *Latin verses*, because they were sent him from ——— without interpretation.

I am obliged to his esteem, in supposing me a *Master in an University*. He was never judged worthy of that dignity here: and by his *ingratitude to Glasgow*, he hath proven himself unworthy ever to have had it there, or any where else. And I wonder, that judging me a *Master* here, he should think strange that I am not so *Pedantick*, as (in imitation of him) to stuff my *Letter* with *Latin Sentences* altogether impertinent to our debate; and which in his *Letter*, and his *review* of mine, serve for nothing so much as to express his *malice and virulency*. Yea, there be two things which I think more then strange inconsiderateness in him. The first is, that he accuseth me for not writing pertinent language in my *Mother tongue*; whereas in the very next page he writes, *He hath done as the Ape did, that thrust the Cats foot into the fire, because he durst not do it himself*; whereof, if he or ——— make good sense and *Grammar*, I shal give him back one of those *Guinies* which I am to have for everting his *Theorems*.

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The other is, that he should challenge an *University-man* for writing a *Letter* without a *Latin Sentence*, whereas he hath written *Volums* of *Mathematicks*, without ever (for any thing I have yet seen) citing a *Classick Mathematician*, except once *Euclid Prop. 24. lib. 1. El. Geom. in the 265. page* of his *Hydrostaticks*, and that erroneously. For *Euclid* hath two sides in one triangle equal to two in another, and our Author hath only one side in each triangle. This is like the Tarsel of a *Mathematician*.

I had reason to ask, *Where are our doli & fallacie, tabula & testes, sapientia ad quam putamus nos pervenisse?* For, first, none here being further concerned then in answering his importunate Letter, desiring the *Universities* encouragement for printing his *Hydrostaticks*; how could any so much as dream, that a man in his right wits, should provoke others to overthrow the title of a Book *Tabulis & testibus*, after he had once refused to let them know any part of what was contained in the Book? And yet this Author hath done it, as he himself testifies in the 310. page. Sure no other would, for this

this dexterous wit is peculiar to him. But good Sir Sciole, let me tell you, it had been as great wisdom, either still to have concealed your great knowledge, or else to have kept up your *provocations*, whereby you should have saved me from the trouble of producing proof & witness against you, and your self from the shame of being convicted guilty of both *Ignorance* and *Inso-
lence* by them: For I assure you, that before your *Indiscreet Challenges*, I had no design to expose the folly of your *arrogant pretences*, and the contemptible infirmity of your *acquittances*, otherwise I might have drawn very lucky instances of both from your *Ars magna & nova*, &c.

Secondly, before he charged upon the *Masters* here his *doli & fallacie*, there was nothing which could be a ground for it, seeing all that had past, was his Letter desiring their concurrence to the printing of his Book, and their answer, wherein they declare their mind with much candour and calmness. And he tacitly acknowledgeth the injustice of his challenge, in answering my question from that Letter in which the question it self is contained: For it is
against

against both Reason and Religion, first to calumniat, and then to justify the calumny from something posterior thereto; and it is yet the worse in him, that he doth it by an untruth, in alledging my letter to have another design, then any, except himself, can discern; nor would he see it, if any other thing could be found to excuse his malicious reflexions upon persons of known integrity.

Thirdly, there are none among those whom he reproacheth, who have been so long at his School, as to learn either arrogantly to pretend to the knowledge of those things to which they are *strangers*; or vainly to fancy themselves knowing in that whereof they are *ignorant*.

After this, my Author proceeds in such a strain as would almost provoke *Meekness* her self to make a *Satyr*. But it is so pitiful, that it cannot excuse a serious answer from being impertinent; and therefore I pass it, without suffering my self to digress into *Satyrick reflexions* upon his vanity therein. Only I beg his liberty, that since he hath made me *the Cat*, I may henceforth, without offending him, catch *the Rat* as oft as he comes in my way.

Now

Now my Adversary sufficiently animat
with rage, prepares himself for making a
furious assault upon some passages of my
letter, about perfection of *Sciences*, and be-
gins it very learnedly, by bringing in the
Historical part of Geography, as a part of the
Science of Geography; which is as good *La-
gick*, as if he had said, that black is a part
of white, because they are both colours.
But that he may the better understand this,
I tell him, that *Geography simpliciter* is not
a Science: for a great part of it is only Hi-
story: and I cannot suppose him so igno-
rant, as not to know that *Science* and *Hi-
story* (albeit all learning, as almost all things
else, receive their denomination from the
most noble part) are very different: Espe-
cially in *Mathematicks*; where the scien-
tistical part is firm and Geometrical, and
the Historical part subject to the weakness
of our senses; the one consisting in *Me-
thods* and *Demonstrations*, the other in *Prac-
tises* and *Observations*. All these things he
here mentioneth, and thousands more, can
be done by sure and *Scientifick Methods*,
and therefore are perfected in so far as they
are a *Science*; except only the measuring
the

the height of the Sea above the Earth; and this I think can only be done by himself, to whom it is easie to make Rivers run upwards, and so to work many wonders in *Hydrostaticks*. I am sure that any person who understands *Logick*, will find by these, that my Adversary hath triumphed before the victory, and hath unjustly called my argument a *Fallacy*, while he had only reason to call it a *Caption*, since he was caught thereby.

He next falls upon the *Opticks*, where after he hath vaped a little, to no other purpose then to display his *Pedantry*, and discover his dislike of modest expressions, he asketh a question which proves him a stranger to this part of learning. But that he may reap some instruction from this debate, let him know that the *Opticks* hath scientifically so far perfected the sight, that it demonstrateth this Theorem: *In all Telescopes, as the focus from the eye glass is to the distance of the focus from the object glass, so is the simple appearance of the object to the appearance of the same through the Telescope.* And therefore if the distance from the focus to the eye glass be one inch, and the distance of

of the *focus* from the object glass 100000, the object will appear 100000. times longer or broader by help of the Telescope, then to the simple eye: Or with this Telescope you may see as well at 100000. miles distance, as with the simple eye at one: If the glasses (or rather mirrours, because they lose no rays, and have *cateris partibus*, all one determinat reflexion) be sufficiently large, and of the true Geometrical figure. By the same method, the demonstrative, or scientifick part, teacheth us to see at any finit distance, as if it were three foot or less. The like *consideratis considerandis*, is true in *Microscops* and *Scotoscops* also. If our Author do question this rule, he shal find it in *Escinardi Optica*, and in the *Philosophical Transactions*, page 4005. as also in others before them both. It is like if he had known it, he had spoken better sense in his *New Optical experiment*.

He is mistaken in saying, that it is not known how the sight is made; for it is done by bringing all the rays coming from one point of the *visibile* alwayes to one point of the *retina*. It was never motioned by any learned man (since the *Opticks* came to this per-

perfection) that any brutes yet known, should see otherwise then men: *Fishes* indeed, because of the *dense medium* they live in, have their *crystalline* rounder; and night-beasts, such as *Cats* and *Owles*, their *eyes* larger: yea, many other particulars there are, of which the *Opticks* do evidently demonstrate the reason.

Our Author might have remembered since he was a *Professor of Philosophy*, that lights and colours are qualities, at least according to him; and therefore not the object of any *Mathematical Science*, which is always quantity.

Reflexion and *Refraction* were fully handled by *Des Cartes*; for it is out of doubt, That the angle of incidence is equal to the angle of reflexion, and the sines of the angles of incidence proportional to the sines of the refracted angles. *Infraction*, is the same with *Refraction*, and therefore impertinently repeated.

It is no wonder the *Lord Verulam* was not of my mind; for he died before the time of *Des Cartes*, who brought the *Opticks* to this perfection. But it is no small wonder to find a man pretending so highly

to learning, as our Author doth, and yet print himself a stranger to the progress thereof.

It is true indeed that *M. Newtown* hath discovered an inconvenience in *Refractions*, which was not formerly known, and that therefore *Metallin Mirrours* are more proper then glasses: but this hath not added any thing to that universal rule I presently mentioned, which scientifically bringeth the sight to any degree of perfection, and holdeth in these *Telescops*, as well as in all others: yea, these *Telescops* were known before, only their advantage above others was not known.

What he saith of *M. Hook*, is most improper: seeing there he only promiseth to accomplish or bring to practise what hitherto hath been attempted, or by all most desired; not at all mentioning the *Science*, which our Author questions.

Let any man consider the vast extent of that rule, and think what can be more large. I do not question that there may be many excellent and subtil inventions for promoting sight, as to practise: but I am sure the scientifick part cannot make the
C sight

sight infinitely perfect, and it hath already brought it to any degree of finite perfection.

He flatters himself that he hath gained the victory, as to the *Hydrostaticks*: but upon what account, may be seen in my Letter; which being written in private, only for dissuading him from making himself ridiculous, and for curing him of his blind presumption, was framed to his capacity, and not for the learned world. And seeing it was necessary, because of the importunity of his Letters, to signify to him, that this Science was already perfected, as to all these things whereof he is capable; it was more civilly and respectfully spoken, to say, that the *Hydrostaticks* were already perfected, then to say, that they were further perfected than he could reach.

Our Author should know that all mixed *Mathematical Sciences*, are nothing else but *Geometrical Demonstrations*, founded upon some *Physical Experiment*: So that *Geometry*; to speak properly, is the only Science in *Mathematicks*, and their only store-house for rules, methods, reasons and inventions: It is certainly defective in several things

things; but these are far above our Authors conception.

He next strives to perswade the unlearned, that he hath first taught *Astronomers* the use of *Telescops* and *Pendulum clocks*; but I leave this to the examination of his experiments. Yet I must not pass that which he desires the Reader to mark; to wit, my non-sense, in saying, *That the invention of representing the Sun or Moons motion in a second of time, had been greater, if the eye had been away.* And I intreat the Reader to mark as well, how *M. Sinclars* dulness maketh him impute his own non-sense to me: for in his printed Letter *Feb. 22.* he challenged as a great neglect, that the *Eye* is not added in an expression of a former Letter; as if any could have dreamed that the observation might be without the eye; to which I answered, *That the invention had been greater, if the eye had been away:* and surely so it had: Nor could this have escaped *M. Sinclair*, if he had not wanted his eyes; but his blindness hath made him stumble upon my expression: and because he could not bruise it with his fall, he hath lashed me for his own fault. Surely this discipline

is very near in kind to his doctrine; for they are both unreasonable.

I have nothing to say against his miracles in the *West*, especially that grand one of the Sun seen in Winter for an hour about midnight, eight degrees above the Horizon: except, that it is only mentioned in his Book; no man, I ever spoke to, having heard of it; altho I know many who have been in the place mentioned, and very inquisitive concerning it. Besides, that laying one aside, it far surpasseth all miracles of the heavenly bodies, recorded in sacred History.

If our *Author* think that he was well exercised, when he was making his observations of the *Comet*, he should judge a part of his time well spent, in letting the world know for what they served: but he seems to intend no more; then to make men believe, that he is not ignorant of a degree or a minut, altho he reckons the Suns motion by inches.

I question not, that a *Coal-hewer* is more useful to the Countrey then he and I both: and therefore he is obliged to me, for giving him a more useful trade, then he now driveth.

driveth. Nor can I deny, but he justly deserved it; for a *Coal-bewer* is one who maketh gain by digging in another mans mine; and so hath he done; for that History of *Coal* which he hath printed, is none of his, altho he hath made advantage by the publishing and sale thereof. But this is no great wonder, since the most part of the truths contained in his writings, are digged out of other mens works. And that the Author of this History may not escape the fate of others with whom he maketh so bold, he mixeth with his doctrine, some mistakes of his own, and particularly that erroneous application of *Euclid* above mentioned in page 4. of this Book.

Now my *Lords and Gentle-men*, who are *Coal-masters*, I pray you consider how unjustly *M. Sinclar* inferrs, that I design for you no better name then I have given to him; and how maliciously he thereby endeavours to creat in you a prejudice against me. I highly esteem and honour all such whose knowledge and vertue maketh useful, and ornaments to their Countrey. But pardon me, that I suffer not *M. Sinclar* to usurp to himself the name of a *Philoso-*

lofopher for writing this History, (altho it were his own) since he wants the Science of *Coal*; for it is not History, but Science, that makes the *Philosopher*.

I need not concern my self much in his censure of *Des Cartes*; for he is as far exalted above my commendation, as he is without the reach of *M. Sinclars* detracting tongue.

He may well say, that he is not afraid I shal come the length of his labours in *Glasgow Colledge*, about *Universale*, and *Ensratiois*; for in his last *Logick Notes*, he hath thirty sheets of paper upon *Genus* and *Objectum Logica*, *Universale* and the *Pradica- bles*; which falsifies the first sentence of the *Epistle to the Reader* of his *Ars Magna*.

He might have holden his peace of *Rhetorical* and *Algebraical composition* and *resolution*; for he knows no more of either but the name. If he had read this part of my *Letter* right, he would have had some other *fancies*, then he here expresth; as I should show, were not this too sheepish a subject to be insisted upon.

It is true that a *Letter* was sent to *M. Sinclair*, containing the words which he
prin-

printeth; but it is as true, that the same *Letter* contained the condition of that promise which he there mentioneth; to wit, *If he made it appear that his Book were answerable to his Edict.* The concealing of this is so great a proof of his candour and ingenuity, that infallibly it will procure credit to any thing he affirms.

Now this Good Man having spent many of his spirits in this *tempestuous conflict*, is oppress'd with *drowsiness*; and having fallen *asleep*, he dreams all the rest of his *Postscript*. For I am sure there is not one in this *University*, who ever either had his name in an *Almanack*, or craved any man pardon upon such an account.

I have seen the *Pamphlet* he speaks of with the *Advertisement to the Reader*, and found nothing in it of any *ingenious Gentleman Artist*, set upon inhumanely as by two *Mastives*; but some *Printer* checked for playing the *Astronomer* unhandsomly, and that under a borrowed name, for to make his *Prognostication* the more vendible; a practise too ordinar. Our *Author* here talking of two, judgeth this business to be of the same difficulty with that of D. *Mores*

butter Scion, which could not be sufficiently fenced from the violence of the *Air*, by less then the *Syllogistical* force of two bold brethren.

However, if there be any errors in that *Almanack*, he bewrays his ignorance in passing them; while he lets a sling at the mistake of a *Table*, and at some *Chronological Rhymes*, things of no importance. For the first, it may be imputed to a piece of rashness, occasioned perhaps by the obscurity of that *Tables* explication, but not to ignorance; seeing such trifles, as *Tobacco-box-tables*, and *Pocket instruments*, which produce nothing, but what can be better done without them, conduce not to knowledge: And therefore no reproach for a man to be ignorant of them, being contrived only for *Mechanicks*, and such sensible *Demonstrators* as my *Adversary* is. As for the *Rhymes*, I suppose there is as little necessity of thinking the *Author* of them, and of the *Almanack*, to be the same, as of judging the new and unheard-of *Hydrostatical Theorems*, and the bundle of *Latin Sentences* in the reply to my *Letter*, to have been tursed by the same hand.

I have

I have no regard for *Rhymes*, and yet for recreation, I must take notice of our *Authors* two *Criticisms*; whereof one is, the two last lines exceed the former in a foot, contrare to that of *Horace*,

Primum ne medio, &c.

Consult our *English Poets*, Sir, what weight this authority hath with them. The other is: It should not have been said, *Since that of naught the Lord created man*. But, *Since that of dust, &c.* Pray you, Sir, is this sound *Philosophy*; and if it be, how taught you your Scholars, *Cap. 7. de Causaliatib. Caus. Prim. Creatio est actio cause prime, quæ res primo ex nihilo producuntur*? But who then can this *Prognosticor* be? It is very probable, from the rable of *Astrology*, (for there is none of that profession among us) that he is my *Antagonists Apocalypitical Astrologue*, who *Lib. 6. Dial. Phys. 3. Sect. 1.* besides his *Astrological Predictions*, and *Prophecies* out of the *Old Testament*, did from the *Revelation of S. John*, with great zeal declare many, and these even wonderful things, concerning the number of the *Beast* 666, and the Alphabetical letters *A. B. I. S.* of great affinity with it. The mystery of these

these must not be revealed, lest it occasion the discovery of that divine *Astrologue*.

There is little heat here about *Ens rationis*; that crack-brain'd knave hath evanished, together with his Cousin-germain *M. Sinclars* dearly beloved *Forma substantialis materialis*. For ought I know, they have got in to his *Nihil spatiale*, to erect a *Colledge of Fanatick Philosophers*.

I Am now to examine his *Epistle to the Reader*, where he complaineth exceedingly of *Envy*, because the *Masters* of this *Unversity* would not take his word for the novelty of his inventions: Nevertheless he must grant (if he will be ingenuous) that they have done him a courtesie, in causing him prefix a more modest Title to his Book, then his *Edict* carries.

He wrongs *M. Boyle* egregiously, in causing him say generally, that *Archimedes's Demonstrations* have more of *Geometrical subtility* then usefulness; whereas he saith only (in the Preface to his *Hydrostatical Paradoxes*) that many of his *Hydrostatical Propositions* have more of *Geometrical subtility* then usefulness. It were non-sense to
speak

Speak so of *Demonstrations*, seeing their only use is to prove the thing in question: which if they do, they cannot be called useless; and if they do it not, they cannot be called *Demonstrations*.

Our *Author* now compares his method with that of *Archimedes's* forsooth. He is more speculative, our *Author* is more practical. So may a *Trone-lord* say: *Archimedes* was more speculative in his *Statics*, and he more practical. Next *Archimedes's Demonstrations* are *Geometrical*, and his *Physical*. That is to say, *Archimedes's* reasons are sure and solid, and his are conjectures: And then *Archimedes's Demonstrations* are but for the use of a few, and these for the use of all. He might truly have added, *And for all uses, except to convince*; which is the proper use of a *Demonstration*. As for his last comparison, *Archimedes* was more wise then to illustrat that in his Book, which any mean man might do, and was already demonstrated. But our *Author* needs not imagine, that a rational man will venture any surprising *Demonstration* to the world, without practising it, if he can: yet there was no necessity that he should
swel

swel his Book with it. I say the like of *Stevinus*, in whose *Demonstrations*, I am not afraid our *Philosopher* show any defect, nevertheless that he be pleased to speak at random.

He beginneth now to tell the strange things he hath invented. And first, he saith, that he considereth the pressure of the water with the pressure of the air joyntly. Can our *Author* be so ignorant, that he knows not the arise of the *Toricellian* experiment? Was it not from the consideration of Pumps and other *Hydrostatical machines*, that they had no effect above 33. or 34. foot? Was it not considered here by *Galileus*, that water pressed water no further then its own level; and it was probable, the weight of the Air might press it up the rest of the way (seeing it was not much) which it ascended in the Pump? Upon this account, he projected the experiment first in water, (where was considered the pressure of Water and Air joyntly) and afterwards *Toricellus* perfected it in Quick-silver, judging rationally, that the great weight of the fluid by shortning the tube, would facilitat the experiment. In

M. Boyls

M. Boyls continuation of Physico-Mechanical Experiments, Exper. 13. 14. 15. Doth he not consider the pressure of both together? Yea; is there any intelligent man who now speaks of a Pump, or any *Hydrostatical* engine, without considering both these pressures together?

All these counterposings, which he speaks of, have been tryed by *M. Boyl*, and also many more; to wit, oyl of Turpentine, and oyl of Tartar, &c. but if our *Author* please, he may try it yet with Ale, Beer, Urine, &c. and all these shal be new Experiments. He should have been more general in these tryals, and more particular in the *mysteries* and *secrets* of the *Art* which he hath discovered, and none else can get notice of. *Archimedes* asserts the weights of all fluids in general, and consequently of the Air, if it be a fluid, which the Learned never yet denied: Yea, *Archimedes's* Cōmentator *Rivaltus* (who died long before the *Toricellian* experiment) mentioneth the Air and its weight.

That assertion of *M. Boyl* is true at present, and will constantly be so, suppose every man alive print such *Volums* as our

Author

Author hath done. However, the learned *Doctor Wallace* hath published a Book not long ago, notwithstanding all our *Authors* invention; in which he deduceth more then ever our *Author* shal know of the *Hydrostaticks*, as consecratories from one proposition.

Now, *Reader*, I stay no longer here to consider my *Adversaries* indiscreet railings and provocations; for this were unworthy both of you and me: But that you may know, that I am a man of my word, I proceed to the survey of his works, as I promised in my *Preface*. And I am not a little encouraged to this, by the hope of gaining as many *Guinies*, as may help that pitiful poverty, wherewith he upbraideth me.

But lest he think that the *Probleme* which his *Brother* proposeth concerning the bringing up from the bottom of the Sea, any weight that can be sunk therein, hath bougled me, I think fit to give thee here three several answers thereto.

First then, for effectuating that which is there proposed, you shal take the new invention, called, *The Dying Ark*, one so large that it requires a greater weight to
sink

sink it down, then the *Pondera demersa*: which being sunk down near to the *Pondera demersa*, the Dyver must first bind them to the *Dyving Ark*, and then loose away the weight which did sink it: Now the *Pondera demersa*, being *ex hypothesi*, lighter then the weight which was sufficient to keep the *Ark* at the bottom, must of necessity be pressed up with the *Ark* by the water: and the nearer it cometh to the brim, the motion will be the swifter, not only for the acceleration of the *motion*, but also because the *Air dilateth* it self, and (as I determinat in my *Examination of this dyvink Ark*) the *Ark* is pressed upward with as much force, as the quantity of water equaling the included *Air*, would cause by its weight in the *Air*. But if the *Inventer* will take my word upon it, his *Ark* must be stronger then a *Wine glass*, and without holes in the *bottom*: nay, it must not have a *Glass window* of a foot in square, at least not near the *bottom*. And if the *Pondera demersa* be great, when he hath done his utmost, in case the *bottom* of the new *Invention* get out, you may have supply from the old *Hydrostaticks*: Thus,

You

You shal take at a *low water*, some great strong tuns banded with iron, so many of them, that being all full of water, they are heavier then the *Pondera demersa* in the water; that is to say, that the weight of all these tuns full of water, may weigh more then the *Pondera demersa*, having rebated from their weight, the weight of their quantity of water. These tuns being all emptied and exactly closed, and iron chains or strong ropes tyed to their iron bands, let the *Dyver* go down in his *Bell*, and bind these chains or ropes (all the tuns may be fastened to one chain) to the *Pondera demersa*, as near as may be; and the rising water shal lift the *Pondera demersa* from the ground; which being once done, they are easily drawn any where. If the *Pondera* strike on the ground, at the next low water stent the chains as much as ye can.

I suppose any man who tryeth these ways, will be best pleased with this, which hath been known these many ages: seeing it is far easier to multiply tuns, then to make a vast bulk of an *Ark*, with a bottom proportionably strong, to resist the pressure of the water, and to be troubled with

a weight sufficient to demerge the same. These two *Answers* I have got from my two brethren the inferior *Bedals*, who are as fertile in affording satisfactory *answers*, as my *Adversaries Brother* is in starting subtil *questions*. If it be objected against the last of these two *Methods*, that it can only be practised where the sea ebbeth and floweth, I give you a third.

Take two ships (any of which is sufficient to raise the *Pondera demersa*) the one deep loadned with stones, or any such thing, the other altogether empty. Bind the loadned ship as near as may be to the *Pondera demersa* (which may be easily done by the help of the *Dyving Bell*) and then liver her into the other which was empty: This livered ship shal raise the *Pondera demersa* from the ground, which afterwards may be easily drawn any where. And if perchance they strike on the ground in the drawing, let them be bound again to the new loadned vessel, doing as formerly. This method, I suppose, you will find in *Varro*, who is a very old Writer; and yet if *M. Sinclar* had given it, it is like, he would have lifted it amongst his new

Inventions, as he did *Riccioli's* erroneous argument against the motion of the Earth.

Hitherto I have been employed in parreing those thrusts which *M. Sinclair* gives in at me, through all the *Postscript*, & part of the *Preface* to his *Hydrostaticks*: It is now high time for me to prepare an assault for him, this being a part of my Province: and in forming it, I shal make use of no weapon, but Reason: hoping from it, better success, then my Adversary hath had; & the rather, because he is so great a stranger to it.

The first shal be upon his *Hydrostaticks*, because that began the debate. The second upon his *Ars nova & magna*, because of the reproaches my Masters have sustained for their just censure of it. And the last assault shal be upon his *Tyrocinia*, which indeed is more blameless then the rest, being freest from errours, and more consonant to its title; yet albeit it had no name prefixed, it could not but sufficiently discover the *Tyro* and the *Great and New Artist*, to be all one. All this shal be done in the proper language of each Book, that every work, & its examination, may be understood by the same Reader: And so I begin with the *Hydrostaticks*.

AN
 EXAMINA-
 TION OF
 M. SINCLAR'S
 Hydrostaticks.

*Non equidem hoc studeo, bullatis ut mea nugis
 Pagina turgescat, dare pondus idonea fiam.
 Secreti loquimur: ————— Persf.*

THat I had sufficient reason to quarrel the offer of thirty new and unheard-of *Hydrostatical Theorems*, shal appear from the examination of this Treatise; whereof all that is true, (for a considerable part of it is false and ridiculous) is the same with the doctrine of *Archimedes* and *Stevinus*, in the following Propositions: only our Authors doctrine is more loose, and less precise.

As for what he hath written concerning the Bensil of fluids, generally applyed, is
 D 2 false;

false; ſeing no Benſil hath hitherto been perceived in any fluid, except Air. And ſeing the doctrine of the ſpring of the Air, is called by moſt of Authors, and particularly by *M. Sinclair* himſelf, *Aeroſtatics*: I think not my ſelf obliged to reduce it to the writings of *Archimedes* and *Stevinus*, who wrote only *Hydroſtatics* properly ſo called: yet in that ſubject alſo, (where he ſpeaks truth) I ſhal in its due place trace him in *Aeroſtatical* Writers extant before him.

In the review of this Tractat, I ſhal, for my hires ſake, begin with the *Theorems*; and afterward take notice of a few things in the *Observations* and *Experiments*.

§. I.

The Theorems reviewed, whereof a great part are proven falſe, others ridiculous, and the reſt not new.

I ſhal here at once diſcover the falſity and ridiculousneſs of a conſiderable part of our *Authors Theorems*, and reduce the reſt to theſe following *Propoſitions* of *Archimedes* and *Stevinus*.

Archimedes

Archimedis Positio I.

Ponatur humidi eam esse naturam, ut, partibus ipsius equaliter jacentibus & continuatis inter sese, minus pressa à magis pressa expellatur. Unaquæq; autem pars ejus premittur humido supra ipsam existente ad perpendicularum, si humidum sit descendens in aliquo aut ab alio aliquo pressum.

Prop. 2.

Omnis humidi consistentis atque manentis superficies Sphærica est, cujus centrum est idem quod centrum terra.

Prop. 5.

Solidarum magnitudinum quacunque levior humido fuerit demissa in humidum manens, usq; eò demergetur, ut tanta moles humidi, quanta est partis demersa, eandem quam tota magnitudo gravitatem habeat.

Prop. 6.

Solida magnitudines humido leviores in humidum impulsa, sursum feruntur tanta vi, quanto humidum molem habens magnitudini æqualem, gravius est ipsâ magnitudine.

Prop. 7.

Solida magnitudines humido graviores demissa in humidum, ferentur deorsum, donec descendant: Et erunt in humido tantò leviores,

quanta est gravitas humidæ molem habentis solidæ magnitudini æqualem.

Stevini Postul. 3.

Pondus à quo vas minus altè deprimitur, levius; quò altius, gravius; quò aque altè, æquipondium esse.

Prop. 5.

Corpus solidum materia levioris quàm aqua cui innatat, pondere æquale est tantæ aquæ molis, quanta suæ parti demergitur.

Prop. 8.

Corpus solidum in aqua levius est quàm in aëre, pondere aquæ magnitudine sibi æqualis.

Prop. 10.

Aqua fundo horizonti parallelo tantum insidet pondus, quantum est aqua columna cujus basis fundo, altitudo perpendiculari ab aquæ superficie summa ad imam demissa æqualis sit.

Now, Reader, consider well these Propositions: my Authors Theorems; and my Censure, which is this.

His first two are no Theorems; but only Suppositions. And the third, a sort of a definition, or rather, *aliquid gratis dictum*.

The fourth, as he wordeth it, is false: for a broad fluid counterpoyseth more then a narrower; seing a cylinder of Mercury

one inch thick and twenty-nine inches high, counterpoyseth a cylinder of Air of the same thickness, and of the altitude of the *Atmosphere*: and one two inches thick with the former height, counterpoyseth four times as much Air. As he explicateth it, it is true, and the same with *Archimedes's* second Proposition; for the Demonstration holds, suppose ye divide the fluid by several pipes, if they have entercourse.

Here he maketh a mystery of a very easie thing: for one pillar of water being ten times thicker then another of the same height, and consequently an hundred times heavier, hath no more effect then the other; for because of its base, it hath an hundred times as much resistance. And it is most clear, that if the resistance be proportional to the pressure, the effect must constantly be the same.

His fift, is a part of *Archimedes's* first position.

His sixt also; for *Archimedes's* expulsion hindered with equal resistance on all sides, he calleth, *Pressure on every side*. I suppose he will hardly affirm, that this lateral pressure was not known before him; seeing

Stevinus doth demonstrat, how much it is upon any plain howsoever inclining, in his *Prop.* 11. 12. 13. which our *Author* cannot do yet; at least, there is nothing in his Book either so subtil or useful.

His seventh is the same with the last part of *Stevinus's* third *Postulatum*.

The eight is manifestly false, (if fluids have a *Bensil*, as he supposeth, *Prop.* 17. 19.) which I demonstrat from his own figure thus. The first foot E having one degree of weight, and the second foot I having equal quantity or dimension, and being lower then E, must have more weight; (according to his 17.) let it therefore have $1\frac{1}{2}$ degrees of weight: then the weight of both these must be $2\frac{1}{2}$. Now the third foot N, being of equal quantity with I, and lower, must (according to his 17.) have more gravity then it hath; (to wit, $1\frac{1}{2}$) let it therefore have 2. degrees; and then the weight of all three is $4\frac{1}{2}$ degrees: but $1. 2\frac{1}{2}, 4\frac{1}{2}$, are not in *Arithmetical* progression; and therefore the *Theorem* is false.

I must take notice, that if our *Author* had understood so much as the terms of

Art; he would have said, *The pressures of fluids are in direct proportion with their profundities.* His inference there concerning a Geometrical progression is false; for there are many Geometrical progressions more then 1, 2, 4, 8, &c. And it may be in many several progressions, albeit it neither be in Arithmetical nor Geometrical progression. And, suppose he had not contradicted himself, his Theorem is evident from the 10. of *Stevinus*: For, according to it, the weights or pressures of fluids are equal to the weights of respective Cylinders upon the same, or equal bases; but the weights of such Cylinders are in proportion with their quantities, which is the same with the proportion of their altitudes.

The ninth and tenth (as he explicateth himself) are only this, *That fluids press upon bodies within themselves, and press up bodies lighter then themselves in specie*; which is the same with his 6. and 13. The first of which we have examined already: and the other we leave to its own place. But what ground he hath for his *sensible* and *insensible gravity*, I shal discuss in the examination
of

of his *Ars magna & nova*, which is all built upon this wild notion.

His eleventh is manifestly false, as I shal afterward demonstrat from his own principles: for the Cylinder acquireth only a greater base, (our Author must understand that an Horizontal surface is the base, and sustains the pressure) and consequently a greater resistance, which maketh the same weight of less effect. It is evident that a weight of lead cannot press two foot in square, so much as one: yea the pressures of the same weight are alwayes *ceteris paribus* in reciprocal proportion with the surfaces they press; as it is known by all Mathematicians, except only such pitiful ones, as our Author.

The twelfth is evidently false; for, if we take a bladder, or any tender vessel half full of water, and put the sides of it together, the fluid shal be moved from the unequal pressure of the vertical surface.

The one half of the thirteenth is a part, but a very smal one, of *Archimedes's* seventh, and eighth: The other half is also a smal parcel of *Archimedes's* sixth.

His fourteenth is so much as he understands

stands of *Archimedes's* fifth, and *Stevinus's* fifth.

The fifteenth, seventeenth and nineteenth are false; unless the fluid have a spring, or be heterogeneous; none of which he hath made out: but if it were made out, the thing is obvious, and noticed by *M. Boyl* in the *thirty-sixth Experiment*; yet only in the Air, which is known to have a spring.

His sixteenth is ridiculous; seeing we see daily fishes, little particles of earth, horse hairs, and many other such bodies betwixt the surface and bottom of the water. Yea by adding a sufficient quantity of lead to a body lighter in *specie* then water, it may be made practicable: and is demonstrated both by *Archimedes* and *Stevinus*, supposing the water homogeneous; the contrair of which, our Author hath not yet made out. And more, even a bodie considerably heavier in *specie* then water, beaten out thin and broad, especiallie if it be concave below, may be suspended for a considerable time betwixt the surface and bottom of the water, providing it be laid parallel to the Horizon. But passing by all
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this

this, his method is unpracticable, and supposeth, without proving any thing, that water can suffer any degree of compression; and stones, lead, with other bodies, none at all.

His eighteenth is the same with *Archimedes's* seventh, and *Stevinus's* eighth.

His twentieth is the same with his seventh, otherwayes he grants it not exactly true.

His twentyone (as he wordeth it) is most manifest from that Statical demonstration I mentioned: For seing pressures of the same weight are in reciprocal proportion with their resistances, and the resistances or resisting surfaces can be diminished *in infinitum*; it is evident that the least weight can produce any pressure, whether the heavy body be fluid or solid. But he explicteth himself otherwayes, relating to the spring of fluids, which is not yet proven in any fluid, save Air; and besides this, the Theorem is ridiculous, seing the spring of any part (where all are equally pressed) is equal to the spring of the whole: for one pound weight presseth one foot as much, as two pound presseth two; and even so in any spring.

His

His 22. and 23. are made manifest by Pecquet in his *fourth Experiment*, and *M. Boyle* in his 19. *Physico-Mechanical Experiment*, yea throughout all that book and many others, constantly calling the weight and spring of the Air diverse, and yet bringing them both in for that same effect.

The 24. is ridiculous; seing it is true and obvious in all things, if there be no penetration of bodies.

The 25. is evidently false, seing waters upon the tops of hills support less, and in valleys more. Yea *Doctor Wallace* sheweth in his *Mechanicks*, pag. 728. that the *Mercury* both in *M. Boyls Baroscop*, and his, fell sometimes at *Oxford* below 28. inches, and other times above thirty, and in the page 740. he mentioneth unquestionable experiments of 34. 52. and 55. inches. The contrair of this Theorem is also evident from many of our Authors own experiments, if any man think them worthy the looking over. And suppose he had hit right, this is nothing but the old *Toricellian Experiment*.

His 26. is imperfect; first, seing he speaketh only of fluids to be pressed up, it
being

being also true in all other bodies. Secondly, he doth not determine how far the sphere of activity reaches; and yet all this is easily done and demonstrat from *Stevinus* his 10. For the body is pressed up, till it together with the fluid betwixt it and the bottom (not regarding what else intervene, but reckoning all for fluid) be equal in weight with a column of fluid, whose height is the same with the height of the fluid, and its base the same with the base of the former fluids portion, or equal to it: and besides all these, this is not different from *M. Bøyls eleventh Paradox*.

His 27. is to say, that a pound of wool weigheth as much, as a pound of lead.

His 28. is the same with that which he would say in the 4. and is true also in solids; if ye speak only of columns: For two unequal columns of the same hight and matter press equally, seing their resistances are proportional with their weights. In fluids (as I said alreadie) it is the same with *Archimedes's Second*.

His 29. might have been more general, to wit, *That there can be no motion in fluids, without an unequal pressure*: And then it had

had been the same with *Archimedes's* first position.

His 30. is also a part of *Archimedes's* first position. For seeing pressure is judged only by expulsion the effect of it; and the expulsion is always caused where the least resistance is; which may be in a crooked line: wherefore then is not pressure also in crooked lines?

His 31. is the 10 of *Stevinus*. Here again he justleth with that great difficulty, which I discussed in the 4. and telleth there is no way to answer, but his.

In his 32. the *Pondus & Potentia*, are to say in plain *Scotts*, a pressure and a resistance. He hath told in his 5. that in all fluids there was a pressure; but now it comes in his head, that a man may fancy a pressure without a resistance; & therefore he must guard against that. I suppose here, that his definition of the *Statics* is new; otherwise the *Trom-lords* are the greatest professors of it.

His 33. is to say, that there must be a motion, when the pressure is greater then the resistance; which is yet a part of *Archimedes's* first position, and never doubted of by the greatest ignorants.

§. II.

The Authors last Theorem, for its good service, examined by it self.

NOW let us examine his last *Theorem*, which certainly should be the utmost reach of his wit; and therefore I will examine it more narrowly.

First, let his two fluids in *aquilibrium* be, Water the one, and Quick-silver the other. The natural weight of Water being 1. the natural weight of Quick-silver is 14. Therefore according to his *Theorem*; as 1. the weight of the one is to 14. the weight of the other; so is the height of the one, to ~~wt~~, Water, to the height of the other, to ~~wt~~, Quick-silver: and therefore the Quick-silver should be 14. times higher than Water, which I leave to be determined by experience. He should have said, as the natural weight of the second, is to the natural weight of the first: Or rather, that their altitudes are in reciprocal proportion with their weights, or in direct proportion with their levities.

Secondly, then in his progress, he saith,
That

That by what proportion the one liquor is naturally heavier or lighter then the other, by that same proportion the one Cylinder is higher or lower then the other: here insinuating, that the weights and levities of two bodies are in the same proportions; and yet their proportions are reciprocal, and that is to say, just contrair: or otherwise, he must take the heights proportional with the weights, and the lowness with the levities; which are both false. At last, when he comes to his example, he makes the heights proportional with the levities, which I grant to be his meaning; but this sheweth an intolerably confused wit.

Thirdly, even this being granted, I shall demonstrat, that it doth contradict almost all his *Theorems*. And to that purpose, I assume these two *Postulata*.

Post. 1. *Fluids which have their weights or pressures proportional to their profundities, can have no Bensil.* For if they have a Bensil, their pressure is not proportional to their profundities, (as I did demonstrat at his 8. *Theor.*) which is against the hypothesis.

Post. 2. *Quick-silver or water, have their weights and pressures in proportion with their*

altitudes. At least, so far as any man yet hath made tryal; as *M. Boyle* witnesseth in the first *Appendix* to his *Paradoxes*; yea, our *Author* affirmeth it of all fluids, in his 8. *Theor.* and many places of his *Experiments*. The demonstration follows.

Here upon the surface of the Earth, let the height of a Cylinder of *Mercury* be A, its weight, or the weight of the Cylinder of Air counterpoysing it B, the height of this Cylinder of Air C. Also let the same Cylinder of *Mercury* be lifted up some distance from the Earth, and the *Mercury* will fall, so that the Cylinder of *Mercury* is now lower, whose height we call D, and weight, or the weight of its counterpoysing aërial Cylinder E, the weight of this aërial Cylinder F; let the proportion betwixt the weights of *Mercury* and Air be as G unto H. By our second *postulatum*, A is unto D, as B is unto E; and by this 34. *Theorem*, H is unto G, as A is unto C: and also H is unto G, as D is unto F; and therefore A is unto C, as D is unto F; & *permutando*, A is unto D, as C is unto F; but A is unto D, as B is unto E; And therefore B is unto E, as C is unto F; and consequently (by
the

the first Postulatum) the Air hath no Bensil; which is contrair to many of his *Theorems*, and all his *Experiments*.

This destroys all his methods of measuring the height of the *Air*, *Clouds*, and *Atmosphere*, both here and in his *Ars magna Canonica*. He might have known this mistake many years ago; for *M. Boyl* rejecteth this proportion betwixt the altitudes of the Air and of the Quick-silver in his 36. *Physico-Mechanical Experiment*, upon the same account. This letteth our *Author* see, that if fluids have no Bensil, his *Theorem* was obvious, and known to all.

§. III.

The Authors great skil in Dioptricks, examined.

IN his third *Observation*, he maketh himself exceedingly ridiculous. For, first, he sheweth not how much the *Telescope* required, should magnifie.

Secondly, he sheweth not how far the *Telescope* should be drawn out for this effect; for that draught which serves for a distinct and clear sight, will not serve exactly

to project an Image; seeing light requireth always parallel, or diverging rays, and the projection of an Image, converging.

Thirdly, he seemeth to attribute the magnifying of *Telescopes* to their length and goodness of the glasses; and yet there may be the best glasses imaginable placed in their due distance in a tube of 50. foot long, and not do so much as an ordinar tube of 5. inches; and yet both the glasses may do wonders with others which give them their due charge.

Fourthly, he requires both the glasses to be very good, and there is no excellency required but in the object glass.

Fifthly, he speaks of the Image, as if it were both near to the Tube, and far from it; and yet it hath one determinat place, the draught of the Tube never being altered, which he never once mentioned.

Sixthly, he speaks of the Image of the Sun; that it is the more distinct, the nearer the glass; and yet this brightness near the glass, is nothing but a confused concurrence of rays.

Seventhly, when he hath observed his inches, he reduceth them not to degrees, minutes

minutes, or seconds, &c. for the Sun's motion is not reckoned in inches.

Lastly, suppose he had done all these things aright; this method hath been ordinarily practised above these thirty years: Let him look *Hevelij Selenographia*, *Scheineri Rosa Ursina*, and *Doctor Wallace* in the end of his *Arithmetica infinitorum*.

It is here to be observed, that these *Authors* by such observations designed not to render the Sun's motion sensible to the eye. (which our *Author* values so much, and by some here was formerly called ridiculous) but only to observe its spots together with their motion, or else its eclipse: noticing only by the way, that swift motion of the Sun's Image, which was troublesome, and constrained them oft to alter the position of their Telescope.

S. IV.

Our *Author's* new Diving Ark, put to tryal.

THERE is nothing in which our *Author* is more mistaken, then in his *Diving Ark*; for in all his discourse, he not only

contradicts himself, (which is ordinar, and no great matter) but also the general doctrine of the *Hydrostaticks*. I shal therefore, to undeceive his Reader, demonstrat, That his *Dyving Ark* sustains precisely as much pressure under water, as if it were hung in the Air with as much water in it, as now it hath of Air, rebating only a smal matter which the compressed Air in the Ark weigheth. I do it thus.

In his own figure, pag. 179. let PQ be the surface of the water within the Ark, PY the distance of that surface from the upper horizontal surface, NY the distance of the top of the Ark from the upper surface. According to his 7. *Theorem*, the pressure is equal at P and at 4 ; and therefore according to his 8. *Theor.* seing the water hath no sensible spring, the pressure at N without the Ark is to the pressure at P , as YN to YP ; therefore the pressure at PQ , overcometh the pressure without the Ark at EH , by the pressure of a column of water, whose base is PQ , and the altitude HQ ; but the pressure at EH within the Ark, wanteth only the weight of the column of Air PQH , to make up the pressure

pressure at P Q; therefore the pressure within at E H, exceedeth the pressure without at E H, by the weight or pressure of a column of water, whose base is P Q, and altitude Q H; abating the weight of the column of Air P Q H E; Which was the conclusion to be demonstrated.

I demonstrate this conclusion, supposing no man within the Ark; but if a man be there, it holds only of the Air about him, taking the man to be equal in weight with so much water. I would gladly know if our Author now would affirm, that, suppose the Ark were no stronger in the sides than a wine glass, yet it might go down 40. fathom without hazard, and that it may have a glass window a foot in square, and holes in the top, wherein ye may put your little finger. Yet I shal help him in one particular; There is more hazard in the first three fathoms, for the bursting or leaking of the Ark, then in the next three hundred, seeing the space filled with Air groweth less. Are these the great matters, which our practical Mathematicians invent, whilst others are nibbling at petty demonstrations?

S. V.

*The honourable M. Boyl vindicated from
our Authors ignorant censure, in
his Exper. 17.*

I Resolved only (having considered the
Extraordinary pains it would take to exa-
mine all the non-sense, contradictions, ab-
surdities, and superfluities in his *Experi-
ments and Observations*, which almost every
page is filled with) to take notice of these
he mentioned in his *Edict*: but seeing him
so bold, as (in his 17. *Experiment*) to insult
over that learned Gentle-man *M. Boyl*,
I must, by permission of more learned Pens,
which this great mans vindication doth
deserve, undertake to demonstrat the truth
of what *M. Boyl* affirmeth: that is to say,
That the water R E P (see the Authors fig. 24.)
*weighed in the Air, is of the same weight exact-
ly, which it hath weighed in the water, accor-
ding to M. Boyls method. I do it thus.*

By my former Demonstration, before
the water *E F R* enter the glass, the glass
P R, is as much pressed upward in the wa-
ter, as it would be pressed downward in
the Air by its fill of water, rebating the
weight

weight of the Air now within it: Therefore the weight which keepeth the glass P R, in *equilibrio* in the water, must be the same with the weight of its fill of water in the Air, subtracting the said weight of Air. Now when the water E F entereth, the glass P R is as much pressed upward in the water, as it would be pressed downward in the Air by E P F, full of water, rebating the weight of the Air E P F, which is the same with the former: and seing at first the pressure of the glass upward, was equal to the weight of all P R, full of water rebating such a weight, and now the pressure is only equivalent to the weight of the water E P F, rebating the same weight; the pressure of it is now diminished by the weight of the water E R F: but the pressure is likewise diminished by the weight put in the scale O; and therefore that weight is equal to the weight of the water B R F, in the Air. *Which was the conclusion in question.*

All that our Author speaks against this, is to no purpose. First, he saith, that the lead casteth the ballance; but that cannot be, seing the lead was there, before the ballance was casten. He concludeth, *That water*

doth

doth press in water, but not weigh in water: I will not call this non-sense, but only retort, that upon the same account, *Air will not weigh in Air*; and yet I believe, he thinks, that he hath weighed Air in its self. It is like, he may say, that this is done by the *Toricellian* tube, where the air is exhausted: so might *M. Boyl* have said, that is in a glass buble, where the water is exhausted: And I may also say of this whole *Hydrostatical* doctrine, that it is exhausted also, and can be no longer, without prejudice, kept back from its grave.

THIS waterish doctrine hath past off with more credit then it deserved, having gasped out its last by vertue of that noble name, *The Honorable Robert Boyl*. I doubt not, *Reader*, but by this time thou art made weary by it; and so am I. Wherefore unwilling to return and rake up its ashes, to thy further annoyance and mine, I shal go forward to the *Ars nova & magna*, and quickly show thee what novelty and greatness is there, without any prefacing; having no other testimony for it, then what is due to the rest of its fellow-works.

 E X A M E N
 A R T I S N O V Æ
 E T M A G N Æ
 G E O R G I I S I N C L A R I .

C A P . I .

Tres primi Libri Dialogorum Philosophi-
 corum, & duo de Instrumentis Hy-
 dragogicis examinantur.

S . I .

Hic rejicitur Authoris Theorema primum.

Ib. 1. 2. & 3. De Baroscopij
 phænomenis, agitur: quod
 Baroscopij vocabulum, sicut
 & quædam alia, se primum
 excogitasse gloriatur Author,
 Regiamque Societatem plagij accusat, ac
 si ea è suis Manuscriptis compilaverit; licet
 res ipsæ jam pridem extiterint.

Dial.

Dial. I. lib. I. Varia proponuntur theoremata, quorum primum (quod tantummodo divisio est, quam membrorum definitiones sequuntur) sic se habet. *Quod corpora fluida, uti Aqua, Aër & Hydrargyrum, duplicem videantur habere gravitatem, unam Sensibilem, aliam Insensibilem. Eam appello* (inquit) *gravitatem Sensibilem, quam sentio, dum veni causa, amphoram aqua plenam, à terra manu allevo & sustollo; quod quidem omnium aliorum corporum gravium, etiam est proprium. Gravitatis Insensibilis, fluidorum solummodo proprium, est illa vis & potentia quâ corpora seipsis leviora sursum pellunt, &c. Virtute hujus, ait Author sub finem Sect. 2. Circumsusum hunc aërem equipondium efficere cum Hydrargyro, vel aqua, adminiculo tubi in formam Cylindri redacta. Sed hæc definitio nullatenus convenit isti potentia, quâ aër cum aqua tubi constituit equipondium, nam virtute ejus, aër aquam (quæ est corpus gravius) in tubo sursum pellit. Nec convenit aquæ; nam hæc in tubo, corpus levius viz, aërem deorsum premit aut pellit. Si dicatur, quod aqua tubi aërem prius quidem deorsum premit, sed sic premiendo, eundem etiam necessario sursum pellit in locum*

locum cadentis aquæ: *Respondetur*, Ob eandem rationem, lapidi cadenti gravitatem istam insensibilem similiter competere; quam tamen, supra assertum est, fluidorum esse propriam.

Theorema tertium Sect. 5. est falsum; nempe, *Aqua & id genus alia corpora fluida in libra naturali pendentia, gradatim insensibilem deperdunt gravitatem, prout gradatim reclinatur tubus vel Siphonis cruris horizontem versus.* Hoc fundamentum est totius doctrinæ, lib. 1. & 2. Dialogorum Philosophicorum, & duobus libris de instrumentis Hydragogicis, traditæ; præterea, id passim fere præsupponitur in plerisque corporum fluidorum phænomenis, per reliqua authoris opera solvendis. Qualis sit illa doctrina, hujus Theorematis eversione apparebit.

§. II.

Theorema prædictum fundamentale de fluidorum gravitate Insensibili evertitur.

Juxta nostri authoris doctrinam, præsertim lib. 1. de Instr. Hydr. dial. 2. & lib. 2. dial. Philos. Dial. 3. Sect. 2. Hydrargyri cylin-

cylindrus 29. digitis altus æquiponderat cylindro aëris eandem cum ipso basin habenti & altitudinem eandem cum Atmosphæra. Hinc, in ordine ad sequentis propositionis demonstrationem, hoc colligo postulatum: 1.

Postul. 1. Gravitationem insensibilem esse eam, quæ Hydrargyri v. g. Cylindrus dictæ aëris columnæ æquiponderat: & proinde, quod major est hæc aëris columna; eo major est etiam Hydrargyri gravitas insensibilis; ita ut, si una aëris columna, alterius sit dupla, tripla, &c. erunt item cylindrorum hydrargyri illis æquiponderantium gravitates insensibiles una alterius dupla, tripla, &c.

Alterum postulatum deducitur è lib. 2. dial. 1. Sect. 10. & lib. 2. dial. 2. dial. Philos. Sect. 5. ubi præter alia, hæc habet verba. Nam inde inferre licet, si divinâ providentiâ aëris altitudo augetur; cylindri mercurialis altitudinem in Baroscopio similiter, servatâ nimirum proportionem, majorem evadere. Et si eâdem providentiâ, ejus altitudo minueretur, minorem etiam Hydrargyri altitudinem fore. Hinc inquam colligitur postulatum 2. quod sic se habet.

Postul. 2. Cylindrorum hydrargyri æquales bases

bases habentium, gravitates insensibiles sunt in directa altitudinem proportionem. Nam cylindrorum hydrargyri æquales bases habentium, duplò altior, aëris aut aquæ duplò æquiponderat, & triplus triplo, &c. Quod etiam patet ex Sect. 8. & 9. Dial. 1. lib. 1. Dialog. Phil.

Nunc sequitur propositio demonstranda Theorematis prædicto contradictoria.

Si sint duo tubi 29. digitis hydrargyri repleti, æquè longi, & æquè crassissimi, superiori orificio octulsi, quorum alter sit ad horizontem rectus, viz. tubus D F, & alter ad horizontem reclinatus, viz. tubus D B; Dico utrumque tubum æqualem habere gravitatem insensibilem.

Fig. 1.

Producatur cylindrus D B usque ad K H, ut sit ejusdem altitudinis cum D F, ducatur etiam Q B ad angulos rectos cum D K, & C H, quæ æqualis erit basi D G, propter æqualem cylindrorum crassitudinem. His factis.

Est insensibilis gravitas cylindri D F, ad insensibilem gravitatem cylindri D H; ut D G, ad D C, seu Q B, ad A B. Erat insens-

insensibilis gravitas cylindri DH , ad insensibilem gravitatem cylindri DB ; ut DK ad DE , seu, ut AB ad QB . Ergo ex aequalitate ordinata, Erit insensibilis gravitas cylindri DF , ad insensibilem gravitatem cylindri DB ; ut QB ad QB ; h. e. sunt æquales. *Quod erat Dem.*

§. III.

Causa erroris in precedenti Theoremate ab Authore commissi detegitur.

QUoniam hoc theoremate fretus, in utroque volumine, ubicunque de fluidis fit sermo, passim fere hallucinatur Author; non ab re duxi, erroris in hoc theoremate fabricando originem detegere, quæ est hæc. Observavit, quod idem tubus eadem mole hydrargyri aut aquæ repletus, versus horizontem reclinatus, æquipondium cum aëre non cōstituat, sicuti fecerat, dum fuit erectus: inde putavit ille, ejusdem hydrargyri pressuram in subjectum aëra debiliorem esse in situ obliquo, quàm in recto: nequiquam animadvertens eandem vim aut pressuram manere posse æqualem, licet ob incrementum resistentiæ de novo adve-

adveniens, minus quam antea efficacem: ut res se habet in hoc casu. Nam hydrargyrus tubi dum est erectus, premit in basin cylindri aërei circularem, suæ basi circulari æqualem: cum verò tubus est reclinatus, idem hydrargyrus premit in basin cylindri aërei Ellipticam basi tubi circulari majorem, ideoque in majorem aëris cylindrum, quam tubò existente erectò. Ac proinde non mirum, si eadem pressura cylindri hydrargyri, tubò existente reclinatò, non possit adæquare resistantiam majoris cylindri aërei ad constituendum æquipondium, sicuti resistantiam minoris cylindri aërei sibi æquiponderantis adæquavit, dum fuit tubus erectus.

Novi objici solere, fluidum magis inniti interioribus tubi reclinati partibus, quam erecti; ac proinde non æquè premere in subjectum aëra, in utroque situ. Sed *Respondetur*, hoc argumentum nihil facere contra præcedentem Demonstrationem; nam quantò magis premuntur partes tubi reclinati interiores circa C B, quam totidem partes erecti; tantò minus inde premuntur partes interiores circa D A, quam totidem tubi erecti partes: (quæ omnes

F

semper

semper in eadem altitudine æqualiter premuntur.) Et consequenter, totus tubi mercurius simul sumptus, æqualiter immititur tubo, in utroque situ: seu quod idem est, quando debilitatur gravitas, seu vis deorsum pellens cylindri mercurialis, ob reclinatorem lateris CB, tanto etiam debilitatur resistentia, seu vis sursum pellens mercurij stagnantis, ob inclinationem lateris DA: ut optimè illustrat *D. Wallisius in sua Mechanica, pag. 717.*

Per hydrargyri gravitatem insensibilem, nihil aliud quam pressuram, quod ad æquipondium cum aëre externo, nunc magis nunc minus efficacem, ob resistentiam nunc minorem nunc majorem intellexit hic auctor: sed quia nunc majoris nunc minoris in hac pressura efficaciarum rationem ignoravit, quando scilicet tanta sit, quanto ad constituendum æquipondium sufficit, quando non; ideo *Gravitas insensibilis* formidabile nomen commentus est egregius hic vocum non rerum novarum artifex.

§. IV.

*Septem absurda præter supra refutatos errores
in prædictis Dialogorum Philosophico-
rum libris, notantur.*

PRæter duorum librorum Artis novæ &
magnæ ineluctabile fatum, prædicti
theorematis ruinâ, labuntur duo libri de
instrumentis Hydragogicis, tum quoad
theoriam, tum quoad praxes circa non ens;
(*Gravitationem scilicet insensibilem*) planè chi-
mæricas: quos igitur absque ulteriori exa-
mine missos facio, quibusdam tantummo-
do absurdis ibidem obiter notatis.

*Primum absurdum committit Author si-
bimet contradicendo, dum lib. 1. de instr.
hydrarg. Dial. 2. sect. 3. hæc verba habet:*
Tubo suum horizontalem habente, ut A B C,
*totum mercurij pondus interioribus tubi lateri-
bus innatur: proindeq, nullum potest habere co-
natum exeundi apertò orificiò A, ——— quare*
*nequit Hydrargyrus illius tubi, utrumlibet extre-
morum A vel O urgere, id est, horizontaliter*
moveri, sed deorsum solum idq, juxta lineas à
*terra centro rectas ductas. Hæc inquam con-
tradiciunt tum primæ Archimedis positioni,*
tum etiam Authoris theoremati, sect. 7. dial.

1. lib. 1. dial. Philos. viz. Corpora fluida, ut aër, aqua & hydrargyrius quaquaversum, uniformiter, & ex omni parte equaliter urgent & premunt. Etiam experientia; nam apertò utroque tubi orificio, effluet hydrargyrus; quod fieri non posset, nisi utrumque ejus extremum mercurius urgeret.

Secundum absurdum est quod occurrit in fine sect. 10. Dial. 1. lib. 2. de instr. hydrarg. Non improbabile hinc deducimus argumentum ad probandum maris summum, montium vertices altitudine adequare, ubi aquarum fontes reperiuntur. Videtur auctor altissimæ rupis Forthane Bass dictæ (ut nihil de alijs loquar) perquam oblitus, dum hæc scriberet, in cuius summo vertice plinquam 50. ulnis supra maris summum, Fons aquæ dulcis habetur. Simile est illud problema, lib. 2. Dial. Philos. 1. sect. 12. quò docetur, ope Baroscopij investigare montiumne cacumina, an maris summum sit altius, æqualemne habeant altitudinem.

Tertium absurdum, est problema illud, lib. 2. dial. 1. Philos. quò ex diversis hydrargyri in Baroscopio altitudinibus, & altitudine montis aut pyramidis, per regulam Trium, Atmosphæræ altitudinem esse

6876. passuum, totiusque aëris quantitate secundum reliquas ejus dimensiones colligit & determinat; nam secundum hanc praxin evidens est, aërem ab imo ad Atmosphæræ summum, æqualiter esse densum & gravem; alias proportio non tenebit: Et tamen *lib. 6. Dial. Philos. 2. sect. 7.* ascribit auctor aëri elaterium, item *lib. 1. Dial. Philos. 3. sect. 9.* asserit partes aëris inferiores multo majori compressioni subesse, quàm superiores; & per consequens, quò terræ propiores, eo compressiores.

Quartum absurdum est in sect. 1. Dial. 2. ejusdem libri, viz. determinatio moræ cometarum supra horizontem, absque consideratione declinationis, per solam à terra distantiam; quasi ratione solius distantiæ majoris, eo majorem haberet cometa moram supra horizontem, & ratione solius distantiæ minoris, eo minorem: cum cometa intra octingenta milliaria ad terram, absque ullo occasu, motu primi mobilis, circumvolvi possit, (etiam supposito terræ ambitu, quem ponit Author 21600. milliarium) nempe si existat in axe mundi, vel ed circiter: & 1. contra, è stellis fixis quædam sunt, quæ nullam omnino habent moram

supra horizontem, & alia quae non ultra unam, duas, vel tres horas a nobis conspiciuntur, etiamsi lunâ sint multo altiores.

Authoris imbecillitatem miseratus, regulam sequentem, quâ suorum cometarum supra horizontem sensibilem moras computet, construxi.

$$\text{Sinus altitud. pol. hor.} = a$$

$$\text{Sinus altit. aquat.} = b$$

$$\text{Cos. declin. vera} = c$$

$$\text{Ejusdem sin.} = d$$

$$\text{Semidiameter. terra} = e$$

$$\text{Distam. Cometa} = f$$

$$\text{Sinus totus} = r$$

Reg. Si declinatio sit australis, erit semper cosinus arcus semidiurni supra horizontem sensibilem $= \frac{e^2}{cb} + \frac{adr}{cf}$; At si hac radio major sit, nunquam oritur cometa.

Si vero declinatio fuerit borealis, & $\frac{e^2}{cb} > \frac{adr}{cb}$, erit ejusdē arcus semidiurni cosinus $= \frac{e^2}{cb} - \frac{adr}{cb}$.

Et si hac radio major sit; non oritur cometa.

At si declinatio sit borealis, & $\frac{e^2}{cb} < \frac{adr}{cb}$; arcus semidiurnus supra horizontem sensibilem superabit quadrantem, eritq; sinus excessus, quo dictus

dictus arcus quadrantem superat $= \frac{adr}{cb} - \frac{er^2}{cb^2}$

Et si hac radio major sit, cometa non occidit.

Et tandem, si declinatio sit borealis, &

$\frac{er^2}{cb} = \frac{adr}{cb}$, erit dictus arcus precise quadrans.

Quintum absurdum, est assertio quam ibidem habet, viz. Nos juxta terræ superficiem ad 70. vel 80. milliaria prospicere posse: Cum cuilibet in Elementis Euclidis versato, ex Prop. 36. lib. 3. & prædicto terræ ambitu, demonstratu facillimum sit, hominis octo pedibus alti prospectum ad quatuor milliaria non extendi.

Ut ad unguem solvere possit hoc problema vel ipse Dromo, hanc à me habeat regulam generalem.

Sit terræ diamet. $= a$

Hominis altit. $= b$

Erit semidiam. horiz. sensib. $= \sqrt{b^2 \frac{1}{4} ba}$.

Hinc posito terræ ambitu milliarium 21600. & hominis altitudine 8. ped. Erit semidiamet. ter horiz. entis sensibilis, milliar. 332, quàm proxime.

Sextum absurdum, est contradictio inter Authoris scripta; nam scribens de lagenæ descensu in mare profundum, lib. 2. Dial.

Philos. 4. sect. 10. sic ait, Necesse est, quum quæ altior est aqua, eò validius & fortius evadit ejus elaterium: seu, quod idem est, pressura.

FRANC. Fortiusne similiter evadit incarcerationi aeris elaterium? **ALEX.** Haud dubie:

semper tamen manet aqua elaterio debilius. Et

Dial. 5. sect. 6. ejusd. lib. istis aperte contradicit; tibi enim de quodam Barosco-

pij intra campanam urinariam aquæ immer- sam phænomeno, & accuratissimo in-

ter aquam ambientem, incarcerationumque,

aërem, æquipondio, verba fecisset, addit:

Perbō, incarceratione campanæ aer, cū 34. pe-

dibus demersa, eidemmet subest elaterij gradui,

cui aqua proxima, &c.

Septimum absurdum, idque peccans ad-

versus elementa Geometrica, tale est, lib.

4. Dial. Philos. 1. sect. 8. circa finem,

dum ostendit duo plana ænea rotunda dia-

metri 3. æqu. pondere præcise 100. li-

brarum, pati separationem, quia cylin-

drus æreus, cujus pressura uniantur, 100.

libris est gravis; addit, Si duplo majoris fo-

rent diametri, tum 50. pondo sufficerent: Si

duplo majoris forent diametri priore mensura,

non minus 200. libris est appendendum. Hic

evidenter supponit noster Author, circulos

inter

inter se esse in simplici proportionē diametrorum : quod falsissimum est : nam ex Prop. 2. lib. 12. Elem. Eucl. Circuli inter se sunt, quemadmodum quadrata à diametris, & ex Prop. 20. lib. 6. El. Polygona similia duplicatam habent eam inter se rationem, quā latus homologum ad latus homologum : Ergo circuli sunt in duplicata ratione diametrorum : Consequenter, si corpus æneum planum & rotundum diametri 3. digit. ad se ipsum à simili separandum, pondus præcisè 100. librarum requirat, tunc planum æque crassum duplò minoris diametri, requireret tantum 25. libras ; & planum duplò majoris diametri requireret 400. libras.

Similiter errat lib. 2. Dial. Philost 34 sect. 9, dum ait, Cylindrum æreum trium digitorum in diametro, 100. libris esse gravem ; Volam manus totidem supportant. Tergum hominis promi, sextuplum. Nam sic facit volam (novem ad minimum digitos quadrato continentem) circulo trium digitorum in diametro æqualem : Et quod ad tergum hominis promi, pedi quadrato seu 144. digitis quadratis ad minimum æquale, æstinet ; imo ex suppositione, quod quadratum trium digitorum, 100. tantum æque libras

libras supportet, (quot ipse circulus æqualis diametri posse; locis citatis affirmatur) secundum duplicatam laterum rationem, 1600. libras sustentabit; & tamen juxta Authoris nostri praxin Geometricam, 600. tantummodo libras supportat.

C A P. II.

Reliqui Dialogorum Philosophicorum libri leviter perstringuntur.

Lib. 4. de Vacuitate prolixè satis tractatur, de quo lectorem Philosophicum appello, siquid in eo, de vacui existentia, præsertim in Baroscopio post hydrargyri delapsum, positivè nedum solidè determinatum, in dial. 2. speciatim, aut alibi reperiat: Anne sibi met hac de re contradixerit Author, affirmando in hujus libri dial. 3. sect. 8. *Aliquod corpus spatium hydrargyri delapsæ in Baroscopio occupare: & dicendo, sect. 3. Dial. 2. ejusd. lib. Satis improbabile esse supremam tubi partem æthere repleri; Cum nihil per Æthera intelligat Cartesius, quam corpus aëre subtilius. Numne etiam rectè assignaverit Author vulgarem opinionem, scil. Naturam*
penitus

penitus ab inanitate abhorreere, pro fundamen-
to sententiæ æthera astruentis; cum satis
constet, talis corporis necessitatem, ex sen-
tentia Cartesij, ab identitate Corporis & Spa-
tij unice dependere; nequaquam verd ab
ulla natura Exhortescentia aut Appetitu,
quem solis *Viventibus* attribuit.

Adhæc, lectorem Philosophicum appel-
lo, de rationibus, lib. 2. dial. Philos. 2.
pro *Vacuo disseminato*: quantum ijs insit
ponderis. Num etiam *Densingio*, spatiola
inter partes aeris disseminata probanti esse
aliquid, propter ipsorum trinam dimensio-
nem, repugnantiam sapiant distinctiones,
lib. 4. dial. Philos. 3. sect. 2. adhibere, scil.
Dimensionum, in Reales & Spatiales: *Alicu-
jus, in Aliquid reale & Spatiale*; *Nibili, in
nihil reale & Spatiale*? Numne hinc etiam
sequatur, (quod alibi asseritur) *Spatium
esse nihil*; *Corpusque esse in spatio, idem esse, ac
Corpus esse in Nihilo*?

Librum quintum de *Autise Phanomenis*
missum facio: Libri etiam sexti tentamina
ad *Motum perpetuum puerilia*; Libros item
de *Instrumentis Hydragogis*, quos cap. I.
§. 1. & 2. funditus everfos cuius est in
proposito.

Sequi-

Sequitur liber de *Hyroscopio* & *Chronoscopio*; de illo, præter vocabulum, alia non nulla ab ipso, alium quendam mutuatum esse veretur Author. Et tamen rem ipsam à *Baptista Porta*, si non etiam à alijs, se habere fatetur. Ea quæ de *Chronoscopio*, Capite sequenti castigabuntur.

Idcirco munda, soluta, & innotescant verba.

2. *Idcirco* C A P. III.

Probatæ universa Antiquæ doctrina de Pendulo esse falsa.

Dicitur 3. sect. 1. de *Pendulo*, hæc habet verba: *Fateor hoc opus eo difficilius & laboriosius fore nobis, quod neminem adhuc viderimus, quorum dicta vel scripta consuleremus, & quorum vestigijs, si opus foret, insisteremus. Ideo sect. 3. Nostrum appellat Chronoscopium, licet non recens excogitatum. Authori credo, artificium enim sapit artificem; nam ne vel unam veritatem de Pendulo demonstratam continet, sed merus est errorum fasciculus; ut in progressu patebit. Interim, quam maxime observanda est Authoris nostri fiducia inanis, qui, absque ope Geometrica, Motus phænomena aggreditur. Sed ad rem ipsam redeamus.*

Nor-

Normam ex ære vel ferro, multo plus amplitudinis quam crassitudinis parari jubet: in cujus altero extremo fiat foraminulum, per quod ingressus claviculus suspensum radium sustentet, ut videre est in figura *Seç. 2.* Vult etiam normam esse 60. digitis longam, & totidem uncijs gravem. *Pag. 555.* Dein præcognita quædam tradit, unde conclusionem quandam deducit, & hinc propositiones suas de *Penduli Phænomenis.*

§. I.

Præcognita ad propositiones de pendulo, vel examini subjiciuntur.

D*ial. 4. Seç. 3.* distinguit Author in pendulo, motum perpendiculararem & circulaarem, & rursus in hoc, *seç. 7.* motum perpendiculararem & horizontalem. Dividit etiam gravitatem in perpendiculararem & circulaarem: Ratione illius (inquit) placide quiescat pendulum, finitis vibrationibus in perpendiculo AB, cum appetat tamen naturali tendendi deorsum sublatò claviculo centrali: (vide Authoris figuram) Circulaarem gravitatem subdividit in circulaarem descendensem,

Et ascendentem; virtute prioris, aut pendulum ferri deorsum in semicirculo à puncto H ad B: virtute posterioris sursum ferri à B ad R.

Quod ad distinctiones has, lectorem advertere velim, quomodo ulla gravitas dicatur *ascendens*, cum ipse Author, *lib. 1. dial. Phil. 1. sect. 6.* sic definiat, *Gravitas est potentia intrinseca, quâ aptum natum est corpus ferre deorsum.* Insuper, si pro qualibet motus determinatione, varias *gravitatis* species pro demonstrationum basi effingere liceat, novas in infinitum excogitabit quilibet, v. g. *Gravitatem Horizontalem, Spiralem, Hyperbolicam, Parabolicam, Ellipticam, gravitatem Cissoïdalem, &c.* nam per istarum figurarum tubos potest aqua deorsum sursumve ferri.

En quas ridiculas comminiscitur *Gravitatis* distinctiones, pro qualibet motus determinatione, de qua dicturus erat: figmentis eum uti necesse est, qui ad proprietates motus explicandas se accingit, solidis, præsertim Geometricis principiis nudus: Post hæc, in ordine ad propositiones sequentes, quædam *Scienda*, partim absurda, partim sibi repugnantia, præmittit; quorum

Primum

Primum habetur Dial. 4. sect. 4. Radium scil. arcum A B placidè quiescentem, habere solummodo gravitatem perpendicularem.

Secundum est, Radium A B ad H usque elevatum, tum gravitatem perpendicularem, tum circularem habere: priorem, quia extractiō claviculo A, positiōq; planò ad terra centrum inclinante, super quod descenderet, eò indubie progrediretur, quemadmodum lapis de tecto edificij devolveretur, semel demissus. Posteriorem habet, quia sublatiō digito radium in H supportante, confestim ad perpendiculum A B deorsum ruit.

Tertium, Radium A B ad summam altitudinem Gelevatum, omnem suam gravitatem perpendicularem amisisse, atque sic solam circularem habere. Rationem prioris hanc assignat, Quia nullum habet appetitum radius movendi se horizontaliter. Ridiculum & falsum est, dicere radium A G non habere appetitum rectè movendi deorsum, quia non habet appetitum movendi horizontaliter: Hinc enim sequeretur, (contra hujus sectionis positionem primam) radium A B placidè quiescentem, nullam habere gravitatem perpendicularem; nam non habet appetitum se movendi horizontaliter.

Insuper

Insuper ibidem scribit, *Dimidium gravitatis radij ejusdem ad summam altitudinem A G elevati, claviculò suspendi*: Hinc infero, Extractò claviculo, positoque plano ad terræ centrum inclinante, super quod descenderet, eo indubie progredieretur quemadmodum lapis de tecto ædificij devolveretur, semel demissus: (alias claviculus nullam supportaret gravitatem) Ergo secundum ipsum authorem in *Sciendo secundo huj. Sect.* Radius A G habet gravitatem perpendicularem: quod negavit author in *Sciendo tertio*.

A præcedentibus *Sciendis* sibi invicem contradicentibus, infert Author *Sect. 9.* conclusionem hanc: *Radium anenum, quò altius elevatur, eò magis gravitatem lucrari circularem: atque ex consequenti, eò magis amittere gravitatem perpendicularem: & è contrario, quò magis deprimitur, eò magis gravitatem circularem amittere, & ex consequenti eò magis gravitatem perpendicularem lucrari.* Quomodo hoc probatum sit, Authoris verba (etiam admissa ejus distinctione gravitatis fictitia) manifestabunt: Inter probandum, hac etiam utitur ratione. *Ideo nequit pendulum A F (in fig. pag. 555.) plus gravi-*

gravitatis perpendicularis, quantum ad motum rectè deorsum, habere, quam sunt uncia Radij inter 2 & A, & ratio est, quoniam meo digito ejus extremum F: supportanti tot radij uncia innutuntur, quot sunt digiti inter 2 & C, qui sunt propemodum quatuor, & ex consequenti radius sic elevatus minùs gravat claviculum; quatuor uncijs, quam radius perpendicularis AC; Quid multis? Claviculus supportat uncias radij AF: quinquaginta sex, digitus verò quatuor.

Hinc contra authorem infero. Ergo digitus similiter supportabit 60. uncias radij AD, (quia tot sunt digiti inter A & C) & claviculus supportabit nullas, (quia totus radius ex suppositione continet tantum 60) quod est gravissimum absurdum: & etiam contradictorium Sciendo 4. sect. 4. Item isti quod habetur Dial. 5. sect. 1. lin. 9. Quarto, claviculum 30. solum uncias penduli, ad summam altitudinem AD elevati sustinere; & digitum, cui alterum radij extremum D innutitur, totidem supportare, summam 60.

§. II.

*Propositio prima de Pendulo ostenditur
ridicula esse, vel falsa.*

EX prædictis Dial. 4. sect. 6. propositio-
nem hanc primam demonstrare cona-
tur; viz. *Progressum diminutionis vibrationum
penduli, esse juxta sinuum proportionem, id est,
singulas vibrationes alternatim se invicem bre-
viores esse, eadem proportione, quâ inæquales di-
visiones semidiametri AC, sunt se invicem am-
pliores. Et Sect. 7. Hunc clarissime ostenditur
quomodo penduli vibrationes sunt proportiona-
les ad sinus, nam posito, quod à summa alti-
tudine demissum, ad S usque vibraret, oportet
provehatur horizontaliter inter N & MR, in
primâ vibratione. In secundâ ex MR ad O.
In tertiâ ex O ad P. In quarta ex P ad Q, &
ita deinceps: sed illarum divisionum decremen-
tum est ipsorum sinuum, ut patet, conferendo
cas cum semidiametri divisionibus AC. Et ad-
dit: Penduli vibrationes diminui cum propor-
tione ad sinus, quatenus ejus motus est Horiz-
ontalis; non autem quatenus est perpendicularis,
alias forent conformes etiam inæqualibus divi-
sionibus semicirculi BCD, cui experientia, teste
oculo, contradicit.* Vel

Vel hic intelligit author (dum de proportionem sinuum loquitur) relationem quam habent sinus arcuum æquidifferentium, ut apparet ex ejus figura; vel nihil solidi: cum sinus omnem inter se habere possint proportionem: & si relationem intelligat jam dictam, erunt arcus decrementorum omnium vibrationum inter se æquales, quod ipse fatetur experientiæ contradicere: quodque absurdum ipse secutus infert, si vibrationes dicerentur diminui, cum proportionem ad sinus, quatenus ejus motus est perpendicularis; cum tamen per easdem vibrationes consideratas ut motus Horizontales, describantur sinus recti, & per easdem consideratas ut motus perpendiculares, describantur sinus versi: & per easdem prout considerantur distantes à linea horizontali, describantur cosinus arcuum vibrationum.

§. III.

Propositio secunda de Pendulo rejicitur.

PRæcedenti propositioni falsæ aut ridiculæ confusus, hanc secundam demonstrare tentat. Scilicet, *Omnes vibrationes penduli*

esse *Synchronicas*. Quæ quoniam priori hætenus everſæ innititur, cum cæteris pariter est rejicienda; obſervatō obiter unico petitionis principij levi vitio, quod in ejus demonstratione, pro more ſolito, committitur.

Arguit enim auctor ab incremento gravitatis circularis descendentis ad incrementum velocitatis: quam *Gravitatem*, ibidem ſciendum ait reipſa idem eſſe, nempe reſpectu penduli motus, cum *velocitate*: & hinc eſt, ut quot uncias gravitatis acquirit pendulum ex *E* ad *K* elevatum, tot revera gradus velocitatis acquirantur; quibus penduli motus efficitur velocior. Hoc eſt, (per authoris Sciendum jam dictum) quot uncias velocitatis acquirit pendulum, tot revera gradus velocitatis acquiruntur.

§. IV.

Rejicitur reliqua authoris doctrina Dialogo 5. tradita, de hæcēnſ dictis, & cæteris penduli Phenomenis.

Dial. 5. reliqua Chronoſcopij Phenomena proponit explicanda: ubi Sect. I. modum computandi incrementum gravi-

gravitatis penduli, inter ascendendum, primum aggreditur. Ubi notandum est, quod *Dial. 4. sect. 6. lin. 14.* ad probandum progressum diminutionis vibrationum penduli esse juxta sinuum proportionem, hoc medio usus fuerat: *Quia eadem proportionem dimi-*
nuitur radij gravitas ex C ad K, vel L vibran-
tis, quâ inaequales divisiones semidiametri CA
evadunt se mutuo ampliores. Et ibidem dixerat, incrementum illud gravitatis, quod acquirit pendulum inter ascendendum, esse proportionale ad sinus. Hæc, ut dicebam, ad praxin reducere conatur, *Sect. 1.* docendo methodum supputandi numerum unciarum radij ænei penduli 60. uncijs gravis, quas supportat claviculus centralis, & quas digitus, pro singulis penduli elevationibus. Hæc sunt ejus verba. *Sed quomodo desinitè nōstī claviculum supportare 35½ un-*
cias penduli AM, & uncias 40. penduli AL?
(Vide fig. pag. 564.) ALEX. *Extende cir-*
cini mucrones inter 8 & C, & sumptō hujus di-
stantia dimidio, applicetur alterum circini ex-
tremum puncto M, atque oppositum in puncto N
terminari invenies. Docet hoc, claviculum tan-
 tō plus de gravitate penduli AM sustinere,
 quā penduli AD, quantō distantia AN

est major AX, quæ est digitorum $5\frac{1}{2}$.

Quomodo hæc cohæreant, judicet lector: locis citatis, indefinite loquitur de incremento, & etiam de decremento gravitatis Penduli inter ascendendum. Sibi quoque adversatur, nam loc^{us} prius citato, dicit incrementum gravitatis inter ascendendum esse proportionale ad sinus; & tamen illud per dimidia sinuum versorum hic loci supputat. Sed si veri penduli, *h.e.* globi filo appensi gravitatem pro quavis elevatione congruè computare velit author, hac regula sequenti utatur.

Si sit penduli longitudo $= r$

Gravitas globi dum in li-

nea perpendiculari quiescit $= b$

Sinus elevationis penduli $= a$

Erit globi gravitas in elevatione data $= \frac{ab}{r}$

Hanc gravitatis computandę methodum sequuntur prædicta & etiam reliqua penduli Phænomena ab Authore demonstranda. Scil. sect. 4. *Penduli vibrationes juxta sinuum proportionem diminui.* Sect. 5. *Eas esse Synchronicas.* Sect. 6. *Incrementum velocitatis penduli inter descendendum esse ad sinus proportionale.* Sect. 7. *Pendulum tam citò quadrat-*

drantem circuli percurrere, quàm corpus ejusdem gravitatis & figura semidiametrum. Sect. 8. Incrementum velocitatis penduli esse non tantum proportionale ad sinus, verumetiam esse juxta ordinem numerorum quadratorum, ab unitate initiorum, in spatijs post equalia tempora confectis. Sequentibus sectionibus, adducit argumentum Riccioli, quasi suum, ab incremento velocitatis corporum descendentium, adversus Copernici sententiam de motu Telluris, tanquam invictissimum.

Quod ad primum, pari efficacitate id probat, quàm antea: atque insuper hic loci novæ & falsæ nititur Hypothesi, nimirum, Quod nulla alia possint excogitari divisiones, quibus proportionales dici possunt vibrationes, quàm arcus & sinus; Cum tamen omnes lineæ possunt infinitis diversis rationibus in partes inæquales dividi.

Demonstratio secundi & tertij phaenomeni, novæ & falsæ nititur hypothesi: viz. Phaenomeno Sectionis septimæ: quam, præterquam quod quivis experientiæ adversari comperiat; falsam esse, ex duobus postulatis sequentibus hic demonstrabitur.

Postul. I. Duos globos ejusdem ponderis & magnitudinis, integram diametrum perpendicu-

larem AB circuli ADBC, & quamvis ejusdem circuli chordam diametro perpendiculari conterminam, æquali tempore percurrere.

Fig. 2.

Hoc extra omnem contraverſiam eſt poſitum, & à Galileo notatum, *System. Coſm. dial. 4. pag. 335.* ſecundum impreſſionem *Lugdunenſem.*

Postul. 2. Omnes ejusdem penduli vibrationes eſſe Synchronicas. Hoc eſt ipſius Authoris.

Hinc contra Authorem demonſtraturus ſum, Duos globos ejusdem magnitudinis & gravitatis, ſeu (quod idem eſt) eundem, circuli ſemidiametrum GB, & quadrantem DEB, æquali tempore non percurrere. Sumatur arcus EB indefinitè parvus, ita ut non differat à ſua chorda EN, faciendò differentiam omni quantitate assignabili minorem: Ergo, cum (per Poſtul. 2.) globus idem quadrantem DEB, & arcum EB, æquali tempore percurrat: æquali etiam tempore percurreret quadrantem DEB, & chordam EN: ſed æquali tempore percurrit chordam EN, & Diametrum AB, per Poſtul. 1. Ergo, æquali tempore percurreret quadrantem DEB, & diametrum AB; ſed (juxta hunc Authorem) æquali tem-

tempore percurrit quadrantem DEB , & semidiametrum GB ; Ergo, æquali tempore percurrit integrum diametrum AB , & semidiametrum GB . Quod est absurdum. Ergo, globus non percurrit circuli quadrantem, & semidiametrum, æquali tempore. (contra quàm volebat hic author) *Quod erat dem.*

Demonstratio quinti phænomeni, viz. *Incrementum velocitatis penduli esse juxta ordinem numerorum quadratorum*, est, ut reliquæ, parenti similis; ostendit enim mirabilem centralis claviculi influxum in penduli motum, pro singulis momentis ad finem usque; ejusque efficientiam in penduli velocitatem cum proportionem ad sinus: at hoc leve! Innititur præterea hæc dicta demonstratio Phænomeno quarto, quod falsum esse jam demonstravimus.

Præter errores supra refutatos, authoris nostri ignorantiam phænomeni istius in pendulo, quod jampridem omnibus tritum est ac vulgare, ob nimiam ejus jactantiam & insolentiam, absque nota prætereundam non esse censeo. Phænomenon est hoc.

Si sunt duo gravia equalia & similia, B & D, filis AB, & CD appensa: Tempus vibra-

Fig. 3. vibrationis penduli A B est ad tempus vibrationis penduli C D, in subduplicata ratione A B ad C D; seu in ratione A B ad G mediam inter A B & C D proportionalem. Quod in gratiam authoris nostri sic demonstratur.

Sint $AB = AE$, $CD = CF$, Tempus vibrationis penduli A B $= M$, Tempus vibrationis penduli C D $= N$. M est tempus quò grave B cadit ab E, & N est tempus quò grave D vel idem B cadit ab F: & ideo, $EB : FD :: M^2 : N^2$, *b. e.* $AB : CD :: M^2 : N^2$. Ergo, $AB : G :: M : N$. Quod erat dem.

Hinc in gratiam authoris, hanc etiam regulam construxi.

Unius penduli longitudo sit $= a$

Alterius longitudo $= b$

Prioris tempus vibrationis $= c$

Erit alterius tempus vibrationis $= \sqrt{\frac{bc^2}{a}}$

Proprietatem hanc penduli, quod nostrum appellat, eum penitus latuisse, ex dial. 6. de Chronosc. sect. 12. omnibus conspicuum est. Si unquam audiverit, ratio cur eam scriptis suis non inseruerit, facile assignari potest hæc; proportionum ignarus sub-

subduplicatam rationem non intellexit: quod ex scriptis ejus præsertim Hydrostaticis, ubi proportionem *Directam* & *Reciprocam* ubique confundit, clare cernitur.

Dialogum quintum claudit argumento, contra *Copernici* sententiam, ab incremento motus gravium desumpto; de quo quasi invictissimo *Thraſonem* agit; & licet primus omnium eo usus fuerit *Ricciolus*, ejus tamen nulla facta hîc mentio. Dicitur hîc, *Necessariam esse connexionem inter motum terra vertiginosum, & incrementum velocitatis descendentium apparens solum: Quod incumbit probandum.* Afferitur item, *Copernicanos ad unum omnes, incrementum reale velocitatis negare: Quod falsissimum est.* Quid ponderis huic argumento insit, extra omnem contraversiam, adversus *Ricciolum* non ita pridem posuere *Stephanus de Angelis*, & *Andreas Tacquet*, uterque licet Pontificius: quorum rationibus tandem ille succumbere coactus est, ut manifestum est ex *Transact. Philos. pag. 870.* & alibi; quare actum agere supersedeo.

Nihilominus authorem monitum volo, argumentum hoc falsa suffulciri hypothesi, scil.

scil. *Lineam curvam in qua descendit grave cadens*, esse *circularem*: quam prædictus *Stephanus* quandam esse *Spiralem* demonstrat, cujus proprietas est hæc. Quod recta (in *Riccioli* & authoris figura pag. 578.) sumpta ad libitum, *HQ*, *IR*, semper sunt in duplicata ratione angulorum *HAD*, *IAD*. Et nunquam ad *Circulum* appropinquat, nisi grave ad terræ centrum spatium sex horarum decidat, quod in casu *Riccioli* & authoris nostri fit spatium 21. 53. Imo datâ at non concessâ *Riccioli* suppositione, quod prædicta linea sit circularis, nullatenus tamen inde tollitur incrementum velocitatis reale: Quod si hac de re dubitare pergat noster author, primo rogatu satisfaciet è *Pedellis*, alter.

Ego interea, ne cæteris magnis quidem illis artis revera parva immorando nugis, nimia lectori creetur nausea, ad examen *Tyrociniorum Mathematicorum* verbo expediendum memet accingo: in quo, ut ex canda catum dignoscat lector, sufficiat sequentes annotasse errores.

TYROCINIO- RUM MATHEMATI- CORUM EXAMEN.

Dicit itaque (1) noster Tyro (modò hoc sit insigniendus nomine, quem ne vel prima Matheſeos elementa primoribus deguſtaſſe labris certo certius eſt) pag. 26. *Horas planetarias diſtingui per circulos; quas per lineas mixtas fieri norunt Gnomonici omnes.*

(2.) Aſſerit pag. 50. *Sub circulis polari- bus, Gnomonum extremitates in horologijs hori- zontalibus, ut ſemel ab Æquatore digreſſus eſt Sol, Parabolas deſcribere: Cum tamen, in ho- rologio horizontali deſcribatur Parabola, ſolummodo dum Sol eſt in Tropico proxi- mo: Et extra hunc (niſi in Æquatore) ſem- per deſcribantur Hyperbolæ.*

(3.) Pag. 52. dicit, *Gnomones & ſtylos ſuis extremitatibus deſcribere Ellipſes, in zona frigi-*

frigida. Quod verum tantummodo est, cum Sol non occidit; nam cum occidit, semper describitur Hyperbola, nisi in Æquatore: Et cum mediâ nocte horizontem radit, semper describitur Parabola.

Ne amplius noster hic *Tyro*, sub Polari-
bus aut terrarum alibi, in sectionibus Co-
nicis sciaterico horizontali, aut cuivis alij
inscribendis erret: has regulas generales
observet.

Reg. 1. Ubique terrarum, quando Sol occidit,
describitur semper Hyperbola in plano horizontali;
nisi Sol fuerit in Æquatore, & tunc describitur
linea recta.

Reg. 2. Quando Sol non occidit, semper descri-
bitur Ellipsis; nisi idem fuerit horizon cum Æqua-
tore, & tunc describitur Circulus.

Reg. 3. Quando Sol horizontem lambit, descri-
bitur Parabola.

Not. Quod hic dicitur de horizontali, de quovis
alio plano super quod Sol occidit, non occidit, aut
tantum lambit, intelligendum esse.

(4.) Pag. 100. Dum distantiam duo-
rum locorum, quorum alter sub æquatore
sit positus, inquit; Proportionis termi-
nos sic statuit. Ut est radius totus ad comple-
mentum differentia longitudinis; ita complemen-
tum latitudinis data ad complementum distantie
qua-

quæsitæ. Egregiè hallucinatur tum in vocabulis artis, nam, non *radius totus*, sed *sinus totus*, vel simpliciter *radius* dicere debuit: tum in ipsa arte, nam proportio sic se habet. Ut *radius*, ad *sinum complementi differentia longitudinis*; ita *sinus complementi latitudinis data*, ad *sinum complementi distantia quæsitæ*.

(5.) Denique ubi loquitur pag. 120. de Echo taciturna, dicit, *In quolibet speculi Elliptici puncto non potest exaudiri huiusmodi echo, sed in ipso tantum puncto concursus.* (radiorum scil. soni reflexi) Sed in speculo Elliptico nullum tale punctum concursus agnoscunt Mathematici; nam in Ellipsi duo sunt foci, in quorum uno debet statui corpus sonorum, & in altero auris audientis.

Quâ fronte, Methodum suam Echometricam, in præfatione, Geometricam designavit author, cum non nudæ figuræ Geometricæ, verùm demonstrationes methodum Geometricam constituent, lectori dijudicandum relinquo.

Atque jam habes, *Candide & Erudite Lector*, animadversiones hæc leves, in *ingræduli nostri Scioli* egregia & erudita opuscula scombris & thuri jure merito æternum consecranda; quas à me invito,
Arde-

Ardelionis istius insolentia, impudentia & arrogantia extorserunt: quibus virtutibus fretus & inflatus, non tantum in varios exteros, viros eruditos & celebres, rixatricis & furiosæ mulierculæ in morem debauchatus est; sed etiam, ut est os homini offeum, & frons plusquam ferrea, varijs suis compatriotis, nominatim Professori primario inclytæ Academiæ *Glasguensis*,

* *Art. nov.* quàm *Salgucensem* * vocat, (*viro, pag. 296.* quem norunt omnes summò animi

candore, vitæ integritate, multâ & omnigenâ eruditione, præcipuè verò linguarum trium & omnium Orientalium peritiâ præditum, insignem & ornatum) insolenter & impunè hucusque in-

* *Art. nov.* sultare ausus est *. Quare nullus *pag. 472.* dubito, quin meos conatus æqui

bonique consulturus, & veniam mihi daturus sis, sicubi tibi visus fuerim paulò acerbius adversarium tractasse, cujus insulsa petulantia, & insignis procacitas, vel ipsam mansuetudinē, satyram scripsisse cogeret. Interea, ut relaxetur tibi animus ab ægritudine, aut indignatione, quam censeo non potuisse non contrahere, modò pensulatiùs cogitaverit, quantam & qualem ignomi-

ignominie notam patrie sue inurere, quem fucum & fraudem literato orbi facere conatus sit famosus meus antagonista, puerilium, ridicularum, & trivialium tricarum miseram & misere confutam farraginem sub adeo amplis & speciosis titulis prælo committendo. Interea, inquam, ut relaxetur tuus animus à prædicta ægritudine, ne dedigneris tuos oculos convertere in sequentia *Tentamina Geometrica*, quæ sat scio, fatebere æque virum & veram Mathesin sapere, ac quæ à me ad examinis incudem modò revocata sunt, nauci hominem, supinam inscitiam, crassam & stupendam ignorantiam, tum Matheseos, tum naturalis Philosophiæ, altâ & clarâ voce singulis pronunciant & proclamant: Quæ denique examini subicere, modò capiat, aut ad Græcas Calendas capere possit, nostro per me licebit *adversario*. Interim tu ijs utere, fruiere, & Vale.

H


TEN-

TENTAMINA

QUÆDAM GEOMETRICA

DE

Motu Penduli & Projectorum.

I.  Int rectæ AE, DB, hori-
zonti parallelæ; sitque tem-
pus (quo descendit
grave in recta CD) *Fig. 4.*
 $= e$, & AB $= a$, DC $= b$,
DE $= c$: Effet tempus (quo descendit
idem grave in recta AB) $= \sqrt{\frac{a^2 e^2}{b c}}$

II. Et posita $e =$ velocitati in D; foret
velocitas in B $= \sqrt{\frac{e^2 c}{b}}$. Hæc facile eliciun-
tur ex *Galilei*, & aliorum de motu demon-
strationibus.

III. Sint deinde AF. $= a$, EF $= b$, D
F $= c$, FG $= d$; ponitur enim AG ipsi FE
perpendicularis. Descendat itaque grave
per rectam AB, cujus velocitas in B sit $= f$
a des-

descendat quoque idem grave per rectas AF, FD; erit ejus velocitas in D = $\sqrt{\frac{ac f^2 - l^2 d^2 f^2}{ac - l^2 ab}}$. Hoc ex antecedente nullo negotio deducitur; modo animadvertatur mobilis, quod in diversis rectis movetur, imperum seu velocitatem mutari in rectarum occurſu, ita ut velocitas in prima linea ſit ad velocitatem in ſecunda, in ratione radij ad coſinum inclinationis mutue rectarum. Ut in figura, cum motus perficitur in diversis rectis AF, FD; velocitas, quam acquirit grave descendens in F, mutatur in aliam in FD, quæ priore minor eſt in ratione FG, ad FA: Atque hoc verum eſt in omni motu, ſive æquali, ſive quovis modo accelerato vel retardato.

IV. Hinc igitur colligimus motuum præſcriptas velocitates variari tantum propter linearum inclinationes, in quibus diriguntur. Et proinde ſi nullæ tales ſint inclinationes, nullæ etiam ſunt velocitatum ab ordinatis differentię: atque in lineis curvis nullæ tales ſunt inclinationes, & ideo in lineis curvis mobilia eadem velocitate incedunt, quæ in lineis rectis. Hiſce in genere penſatis, dico grave eadem velocitate moveri,

moveri, five in linea curva, five in recta descendat; nam eruditis hactenus innotescit, grave eadem velocitate moveri, five in recta horizonti perpendiculari, five in recta eidem inclinata descendat. Non arduum foret, hoc in penduli descensu Geometricè demonstrare per *hujus tertiam*, ab exhaustione *Archimedeæ*: sed prolixior est hæc summi Geometræ methodus, quam permittit instituti brevitās. Novi hanc doctrinam *Galilæi* experimentis non congruere, dum affirmat mobile citius descendere per arcum circuli, quam per ejusdem chordam; & citius per duas chordas, quam per unam: Item (quod hinc emergit) breviores penduli vibrationes tardius perfici, quam ejusdem longiores. Sed vereor *Galilæum* deceptum esse à gravium elaterio motum præcipitante, quod hic summo pere advertendum est, & seorsum considerandum. Utcunque sit, super hac hypothesis, de tempore quo perficitur penduli vibratio inquiramus.

V. Sit igitur *AHF* circuli quadrans, ex hujus puncto *C* demittatur pendulum. Ducatur radio & horizonti *AH* parallela *EG*, & huic perpendicularis *CD*: pendulum

4 Tentamina quædam Geometrica

Fig. 3. in G eandem habet velocitatem vel impetum, quam habuisset in D, si ex C demissum fuisset. Quæstio nunc est quam cito descendit à C in G? Sit $AF = r$, $AB = b$, $BE = a$, $BC = c$, $\frac{c^2 a}{r} = d^2$. Erit

$$\begin{aligned} \text{tempus, quo pendulum descendit ex C in G} \\ = \frac{2r^2 d}{c^2} - 1 - \frac{2 \cdot b \cdot a^2}{3c^2 a} - 1 - \frac{r a^3}{5c^2 d} - 1 - \frac{3 r b a^4}{7c^2 d} - 1 - \frac{r a^5}{12c^2 d} \\ - 1 - \frac{3 r b^2 a^3}{5c^2 d} - 1 - \frac{5 r b^3 a^4}{7c^2 d} - 1 - \frac{5 r b^4 a^5}{6c^2 d} \\ - 1 - \frac{35 r b^4 a^5}{72c^2 d} \end{aligned}$$

VI. Altitudines penduli vibrationum, seu ipsarum sinus versi, sunt quam proxime in subduplicata ratione quantitatum harmonice continue proportionalium: atque hinc videtur sequi corporis gravis per centrum terræ vibrationes esse in eadem ratione.

VII. Affirmant non pauci in projectorum jactu perpendiculari æquales impetus sub eadem altitudine tam ascendenti quam descendenti mobili inesse: quod mihi nequaquam arridet: cum hinc clare sequatur, motum projectorum, exclusa gravitate, esse æquabilem: & gravis vibrationes per centrum

centrum terræ omnes inter se esse æquales, atque motum hunc in perpetuum duraturum: imo ipsius penduli vibrationes æquales & perpetuæ forent.

VIII. Motus projectorum, exclusa gravitate, videtur æqualiter retardatus; nam unius medij homogenei, quale hic supponimus nostrum aërem, una semper est resistentia; quod impedimentum de novo semper adveniens motum producit æqualiter retardatum.

IX. Propositum nunc sit inquirere, qualis sit linea à motu projectorum descripta, secundum nostram hypothesin composita ex uno motu æqualiter retardato & altero gravitatis æqualiter accelerato. Sit igitur linea recta VK , in qua perficeretur motus projecti exclusa gravitate, & Fig. 6. recta AK (eidem VK perpendicularis) tempus in quo motus perficitur. Tempore AB sit projecti ob gravitatem descensus BF ; ducatur nunc parabola AFI , verticem habens A , & compleatur rectangulum $AKVX$, fiatque parabola XYK , cujus vertex K . Sit tandem curva à motu projecti descripta $VT R P L$; sintque datæ rectæ $BF = ST = a$, $CG = QR = b$,
VS

6 *Tentamina quædam Geometrica*

$VS = e$, $VQ = f$; rectæ vero indefinitæ
sint $VO = g$, $DH = OP = c$: sintque A
 $K = x$, latus rectum parabolæ $AIK = r$,
latus rectum parabolæ $VXK = l$. Mani-
festum est tempus $AB = \sqrt{ra}$, $AC =$
 \sqrt{rb} , $AD = \sqrt{rc}$; & proinde $KS =$
 $\frac{x^2 - \sqrt{4rcx^2 - l - rc}}{l}$, $KQ = \frac{x^2 - \sqrt{4rbx^2 - l - rb}}{l}$, K

$O = \frac{x^2 - \sqrt{4rcx^2 - l - rc}}{l}$ & ideo $\sqrt{4rcx^2 - rc} = lg$,

$\sqrt{4rbx^2 - rb} = lf$, $\sqrt{4rcx^2 - rc} = lg$: Ope ha-
rum trium æquationum, ablatis quantitibus

r, l, x , fit $\sqrt{\frac{e^2 b^2 c}{a}} - gb - l - \sqrt{g^2 ba} = \sqrt{\frac{e^2 c^2 b}{a}} - fc$

$-l - \sqrt{fac}$. Fiat nunc $\sqrt{\frac{e^2 b}{a}} - f = p$, & $b - \sqrt{ab}$

$= q$, emergetque sequens æquatio $\sqrt{\frac{e^2 b^2 c}{a}} -$

$\sqrt{pac} = pc - l - qg$, & ad tollenda signa radica-
lia, utramque æquationis partem in se mul-
tiplicando, & radicem quadratam extra-

hendo $g = -\frac{pc - l}{q} - \sqrt{\frac{e^2 b^2 c}{aq^2} - l - \frac{fac}{q^2} - \frac{2ebfc}{q^2}}$

Unde innotescit curvam $VTRL$ esse pa-
rabolam, cujus constructio est satis expe-
dita, cum V sit ejusdem vertex, & $V\beta$ ip-
sius diameter, factis $Va : a\beta :: q : p$, & re-
ctis $Va, a\beta$, ipsis ST, SV , parallelis: hinc

inno-

innotescit $V \beta$ (cum detur angulus VOP)

quæ sit $\frac{1}{b}$; & proinde parabolæ latus re-

ctum est $\frac{c^2 b^2 - 1 - f^2 a^2 - 2acbf}{12g}$. Ex prædictis

facile colligitur rectam VK tangere para-

bolam in V , & KL eandem tangere in L .

X. Si detur recta $VP = n$, ejusque ele-
vatio supra horizontem PVL : oportet ita
elevare machinam VS , ut projectum deci-
dat in P quoniam OP perpendicularis est
ad horizontem, datur angulus OPV , cu-
jus finus $= s$, sitque anguli ignoti $OV P$ fi-
nus $= v$, & anguli VOP finus $= x$, finus

totus $= r$. Erit $x = v s - \frac{s^2 v^2}{r^2} - 1 - \sqrt{v^2 - \frac{s^2 v^2}{r^2}}$

& $sc = gv$, item $xc = np$; ope harum
trium æquationum, & prioris quæ quanti-
tatis g valorem exhibuit, auferantur quan-
titates ignotæ x, c, g ; & ostendet ultima
æquatio restans post ablatas dictas quanti-
tates valorem ipsius v finus quæsi.

XI. Hinc quoque deducitur. Si gra-
ve ascendens perpendiculariter tempore k
perficiat z , & tempore s perficiat s , tem-
pore n perficere $s^2 zn - k^2 zn - s^2 zn$

$$\frac{-1 - kn^2}{sk - sk^2}$$

Hac

8 *Tentamina quadam Geometrica*

Hac ratione adhuc projectum perpendiculari jactu in eadem altitudine, tam ascendens quam descendens eundem habet impetum; & præterea ex una altitudine velocius moveretur, & ex alia tardius; quæ duo sunt absurda summopere evitanda: at videntur provenire potius à recepto Mathematicorum experimento, nimirum, quod gravium descensus sint in duplicata ratione temporum, quam à nostro commento de projectorum motu æqualiter retardato. Sit enim tempus AB , quo projecti ascensus fiat BI ; item tempora AC , AK , AD , eorumq; ascensus respectivi CG , KM , DO ; ita ut generetur curva AGN , cujus vertex G . Satis probabile est AGN esse Geometricam quandam & uniformem curvam, cum accelerationes & retardationes gradatim & successive fiant; at multorum experientia testatur GMN esse parabolam ab axe GC , & propterea GIA esset etiam ejusdem parabolæ pars altera; quod tamen non videtur rationi congruere. Nos potius existimamus AGN esse quandam hyperbolam (vel saltem hyperboliformem) ita ut AC sit minor quam CN , cujus diameter ducitur à G ad punctum medium

dim
Hyd
lege
l. 3.

de motu penduli & projectorum.

medium rectæ AN : hac enim ratione, GO in parvis descensibus, quales fere hucusque tantum sunt observati, parum differt à curva parabolica; at ex magnis altitudinibus, cum motus acceleratus accedit quàm proximè ad æquabilem, considerabilis forte accedet dissimilitudo; tunc enim hyperbolæ curva vix differens ab ejusdem asymptota recta, motum quàm proximè æquabilem repræsentabit. Qualiscunque sit curva AGN , hæc est una ejus proprietates: exclusa gravitate, sint temporum AB , AC , AK , AD , respectivi ascensus BH , CF , KP , DE ; eritque $AHFPE$ parabola: ductâ GQ curvam tangente in puncto G , fiant arbitrariè AB , GL æquales; erit ML æqualis rectæ IH , & figura GLM æqualis figuræ AIH .

F I N I S.

Errata.

Pag. 56. l. 12. pro *fit*, lege *fit*. p. 57. l. 2. pro *altitudinem*, lege *altitudinum*. p. 62. l. 9. pro *hydrarg.* lege *Hydrag.* p. 63. l. penult. dele *x*. p. 72. l. 9. pro *ferre*, lege *ferri*. pag. 75. l. 4. & 9. dele: & l. 12. dele. p. 83. l. 3. pro *integrum*, lege *integram*.

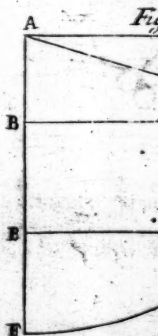
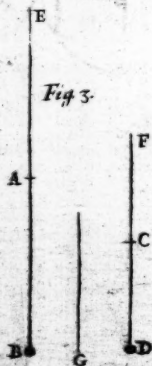
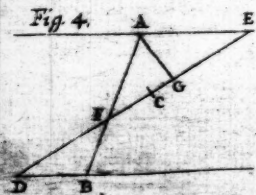
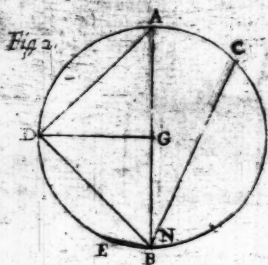
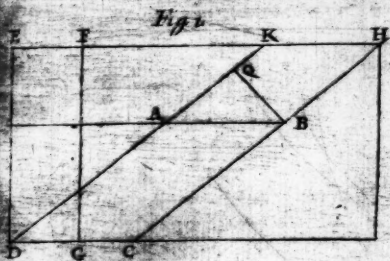
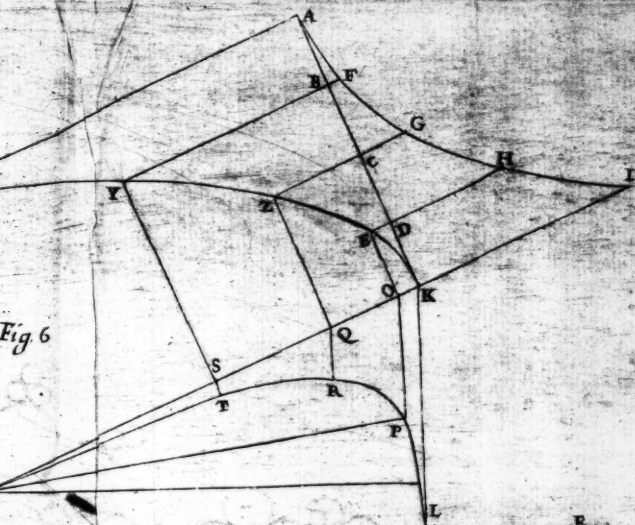


Fig 6



α

Fig 5

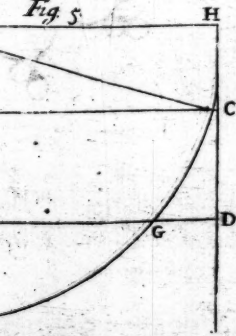


Fig 7

